

University Of Alberta



0 0002 83867 53

Investigating School Mathematics

**Extending
the Ideas**

Accompanying
AV material
at
QA 36.5
E3415 1969
CURR AV

QA

36.5

E34

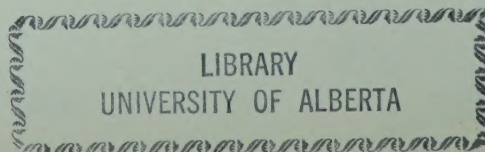
1973

BK.5

ENR•WKBK

CURR

Menlo Park, California • Reading, Massachusetts •

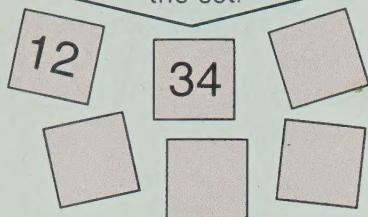


1. You complete the cards. The clouds show the ideas.

Even
numbers

Clue number 1

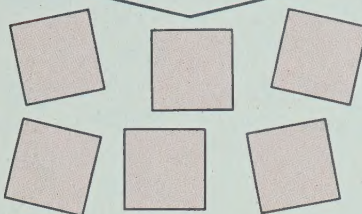
All of these
numbers are in
the set.



Odd
numbers

Clue number 2

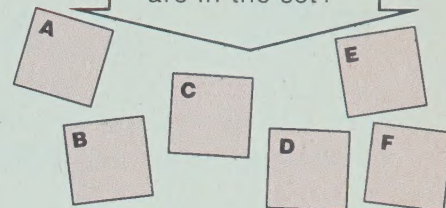
None of these
are in the set.



All the numbers
ending in 0, 2, 4,
6, and 8 are in the set.

Question

Which of these
are in the set?



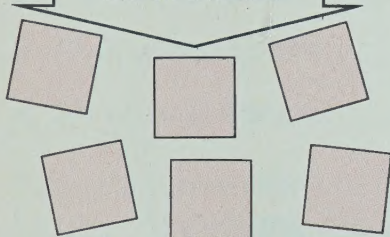
Make cards **B**, **D**, and **E** be in the set.

- 2.

2-digit odd

Clue number 1

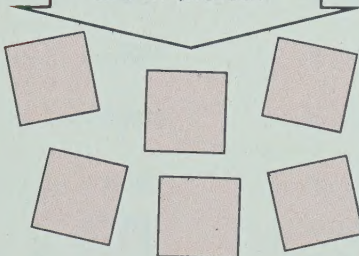
All of these
are in the set.



Any other whole
number.

Clue number 2

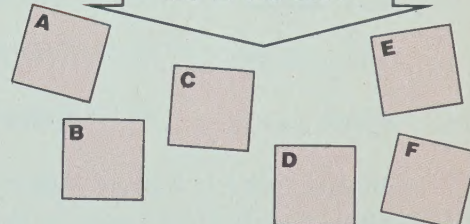
None of these
are in the set.



All the 2-digit
numbers ending in 1,
3, 5, 7, and 9 are
in the set.

Question

Which of these
are in the set?

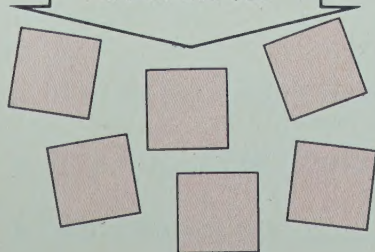


Make cards **A**, **E**, and **F** be in the set.

3. Invent your own set of cards. Write your ideas in the clouds.

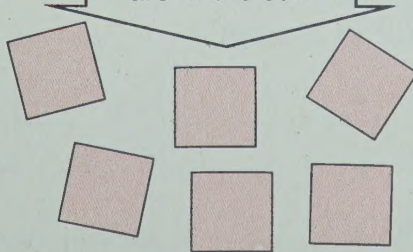
Clue number 1

All of these
are in the set.



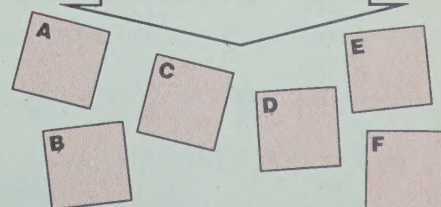
Clue number 2

None of these
are in the set.



Question

Which of these
are in the set?



Make cards **B**, **C**, and **F** be in your set.

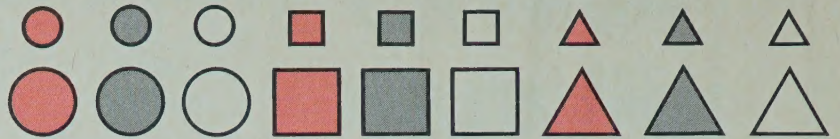
●How Do Figures Differ?

The figures at the right are either

large or **small**;

red, **gray**, or **white**;

circles, **squares**, or **triangles**.



1. Check the ways the figures in each pair differ in size, shape, or color. They may differ in more than one way. The first 4 are done as examples.



size ☒

shape ☐

color ☐



size ☐

shape ☒

color ☐



size ☐

shape ☒

color ☒



size ☒

shape ☒

color ☒



size ☐

shape ☐

color ☐



size ☐

shape ☐

color ☐



size ☐

shape ☐

color ☐



size ☐

shape ☐

color ☐



size ☐

shape ☐

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size ☐

shape ☐

color ☐



size ☐

shape ☐

color ☐



size ☐

shape ☐

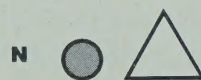
color ☐



size ☐

shape ☐

color ☐



size ☐

shape ☐

color ☐



size ☐

shape ☐

color ☐

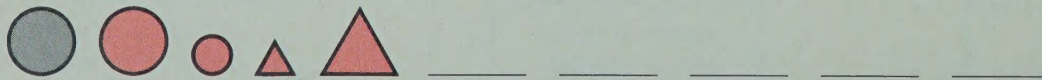


size ☐

shape ☐

color ☐

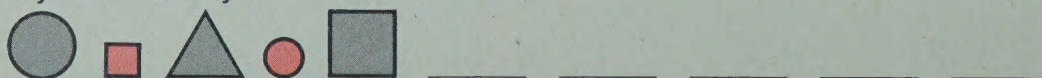
2. **A** Continue the train so each figure differs in one way from the one before.



- B** Now try it so the figures differ in 2 ways.



- C** Try it for 3 ways.



●How Well Can You Reason?

Check the best choice, **A**, **B**, or **C**.

1. Everyone in Joe's class went to the picnic. Sue didn't go to the picnic.
A Sue is in Joe's class. _____
B Sue is not in Joe's class. _____
C No conclusion. _____
2. No one in Southside School is over 16 years old. Tim is 17.
A Tim is not in Southside. _____
B Tim goes to Southside. _____
C No conclusion. _____
3. Some of the class went to the game. Joe is in the class.
A Joe went to the game. _____
B Joe didn't go to the game. _____
C No conclusion. _____
4. Everyone in Pam's club can roller skate. Betty can roller skate.
A Betty is in Pam's club. _____
B Betty is not in Pam's club. _____
C No conclusion. _____
5. Fred plays basketball. All basketball players are tall.
A Fred is tall. _____
B Fred is not tall. _____
C No conclusion. _____
6. No one in the class likes purple. Janet likes red.
A Janet is in the class. _____
B Janet is not in the class. _____
C No conclusion. _____
7. Everyone on the winning team got to play. Al didn't get to play.
A Al was on the winning team. _____
B Al was not on the winning team. _____
C No conclusion. _____
8. None of the books on the top shelf are math books. This book is on the top shelf.
A It is a math book. _____
B It is not a math book. _____
C No conclusion. _____
9. All the fish in the round fish bowl are goldfish. This fish is a goldfish.
A It is in the round bowl. _____
B It is not in the round bowl. _____
C No conclusion. _____
10. There is a game every Wednesday in October. Today is Wednesday, October 17.
A There is a game today. _____
B There is no game today. _____
C No conclusion. _____

● Patterns in Units

Study the pattern. Then give the missing number of units, including the number of units in the next figure in the pattern.

1.



1 unit

2 units

4 units

_____ units

_____ units

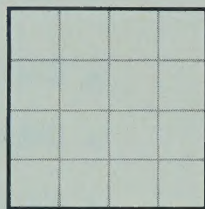
2.



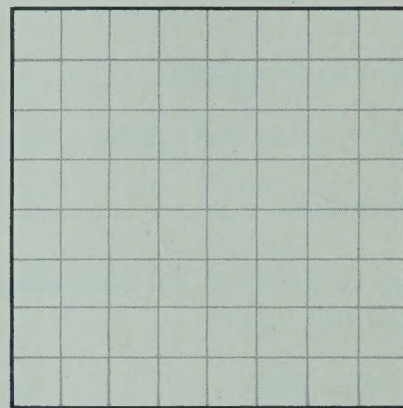
1 unit



4 units



_____ units



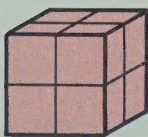
_____ units

_____ units

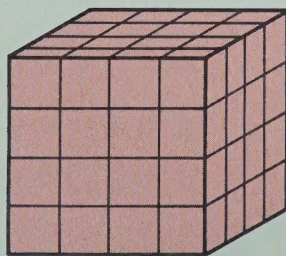
3.



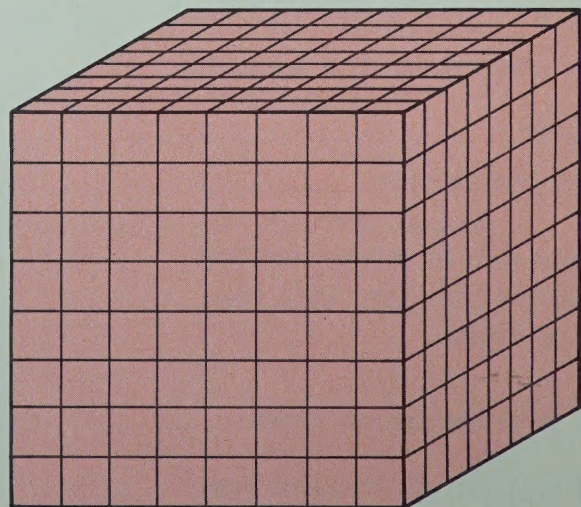
1 unit



8 units



_____ units

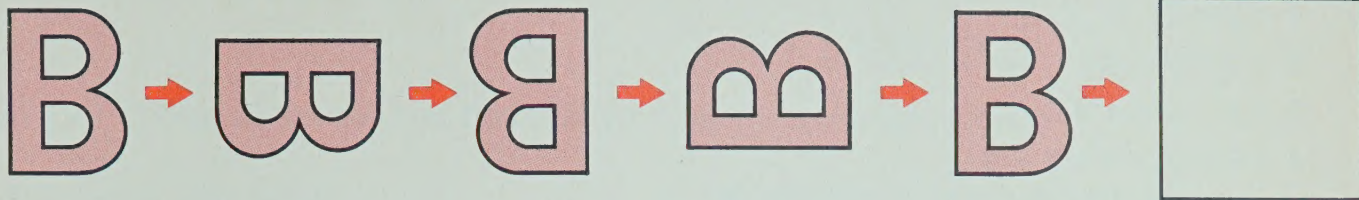


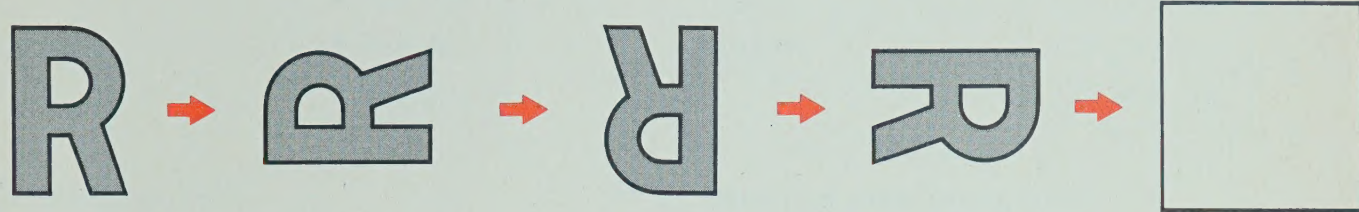
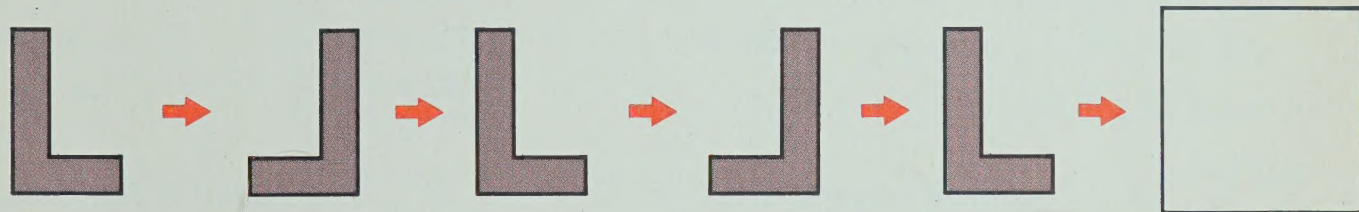
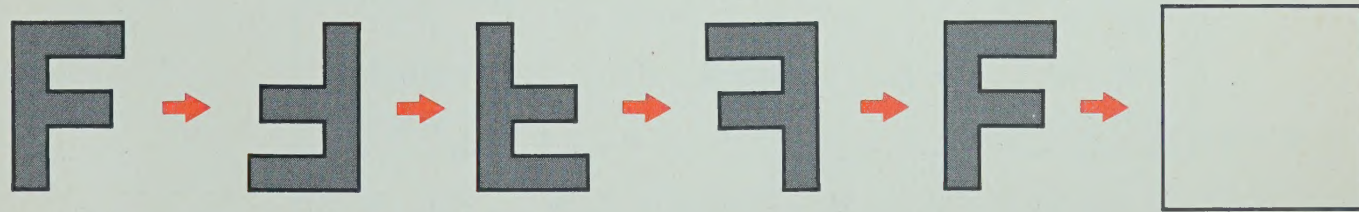
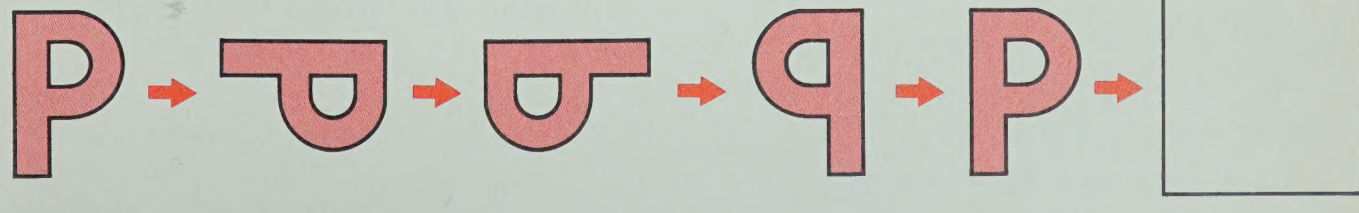
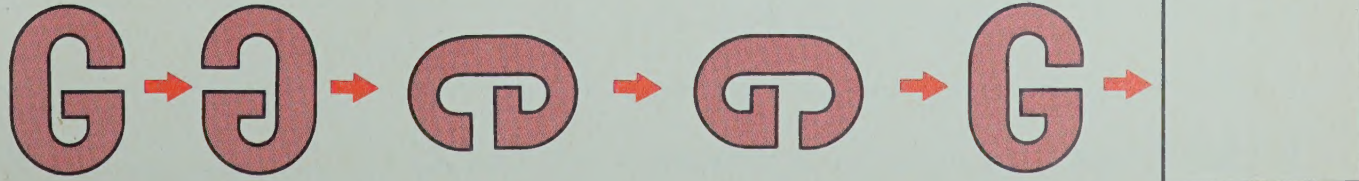
_____ units

_____ units

●Figure "Sequences"

Can you draw the next figure in each figure "sequence?"

1. 

next figure
2. 
3. 
4. 
5. 
6. 

● Number Patterns

Study the pattern. Give the missing addends and check your result by finding the product and sum.

1. $1 \times 2 = 2$

$$2 \times 3 = 2 + 4$$

$$3 \times 4 = 2 + 4 + 6$$

$$4 \times 5 = 2 + 4 + 6 + 8$$

$$5 \times 6 = \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad}$$

$$6 \times 7 = \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad}$$

$$7 \times 8 = \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad}$$

$$8 \times 9 = \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad}$$

2. $1 \times 1 = 1$

$$2 \times 2 = (1 + 2) + 1$$

$$3 \times 3 = (1 + 2 + 3) + (1 + 2)$$

$$4 \times 4 = (1 + 2 + 3 + 4) + (1 + 2 + 3)$$

$$5 \times 5 = (\underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad}) + (\underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad})$$

$$6 \times 6 = (\underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad}) + (\underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad})$$

$$7 \times 7 = (\underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad})$$

$$+ (\underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad})$$

$$8 \times 8 = (\underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad})$$

$$+ (\underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad})$$

3. $1 \times 1 \times 1 = 1$

$$2 \times 2 \times 2 = 3 + 5$$

$$3 \times 3 \times 3 = 7 + 9 + 11$$

$$4 \times 4 \times 4 = 13 + 15 + 17 + 19$$

$$5 \times 5 \times 5 = \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad}$$

$$6 \times 6 \times 6 = \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad}$$

$$7 \times 7 \times 7 = \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad}$$

$$8 \times 8 \times 8 = \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad}$$

Liz said, "The population of the Chicago area is about → 7,000,000."

One of these numbers was the actual population.

Circle your choice for this number. →

7,724,947

6,978,947

6,287,569

Circle your choice in the colored box that you think is actually correct.

1. Detroit area population

about → 4,000,000

4,623,578

actual → 3,349,867

4,199,931

2. Telephones in North America

about → 130,000,000

129,518,103

actual → 120,587,011

146,867,000

3. Car sales in 1971

about → 8,600,000

8,584,592

actual → 7,693,667

8,974,523

4. Montreal area population

about → 2,700,000

2,743,203

actual → 2,190,223

3,697,000

5. Number of minutes

in a year

about → 500,000

531,634

actual → 525,600

448,239

6. Take-offs and landings

at busiest airport

about → 650,000

689,035

actual → 641,429

695,000

Look up some large number facts of your own and report them in the spaces below. On the bottom line give an approximation you might use if you were talking to a friend.

Fact

Fact

About _____

About _____

● Large Numbers

Make 4 slips of paper like these.

A 675

B 469

C 348

D 527

You can “write” different numbers with your slips of paper.

EXAMPLES:

B 469

D 527

A 675

C 348

A 675

B 469

- Using 3 slips at a time, how many numbers can you show and record if the C slip always tells the number of millions?

EXAMPLE

348,469,527

- Using 4 slips at a time, how many numbers can you record if the B slip shows the number of millions?

EXAMPLE

675,469,348,527

- Show each of these.

A Largest with 3 slips

B Smallest with 2 slips

C Smallest with all slips

D Smallest with 3 slips

E A—millions, C—billions
and D—thousands

F B—thousands, D—millions
and A—billions

- Complete these inequalities using 2 slips on each side.

EXAMPLE

675,348 > 469,527

_____ > _____

_____ < _____

_____ < _____

_____ > _____

_____ > _____

_____ < _____

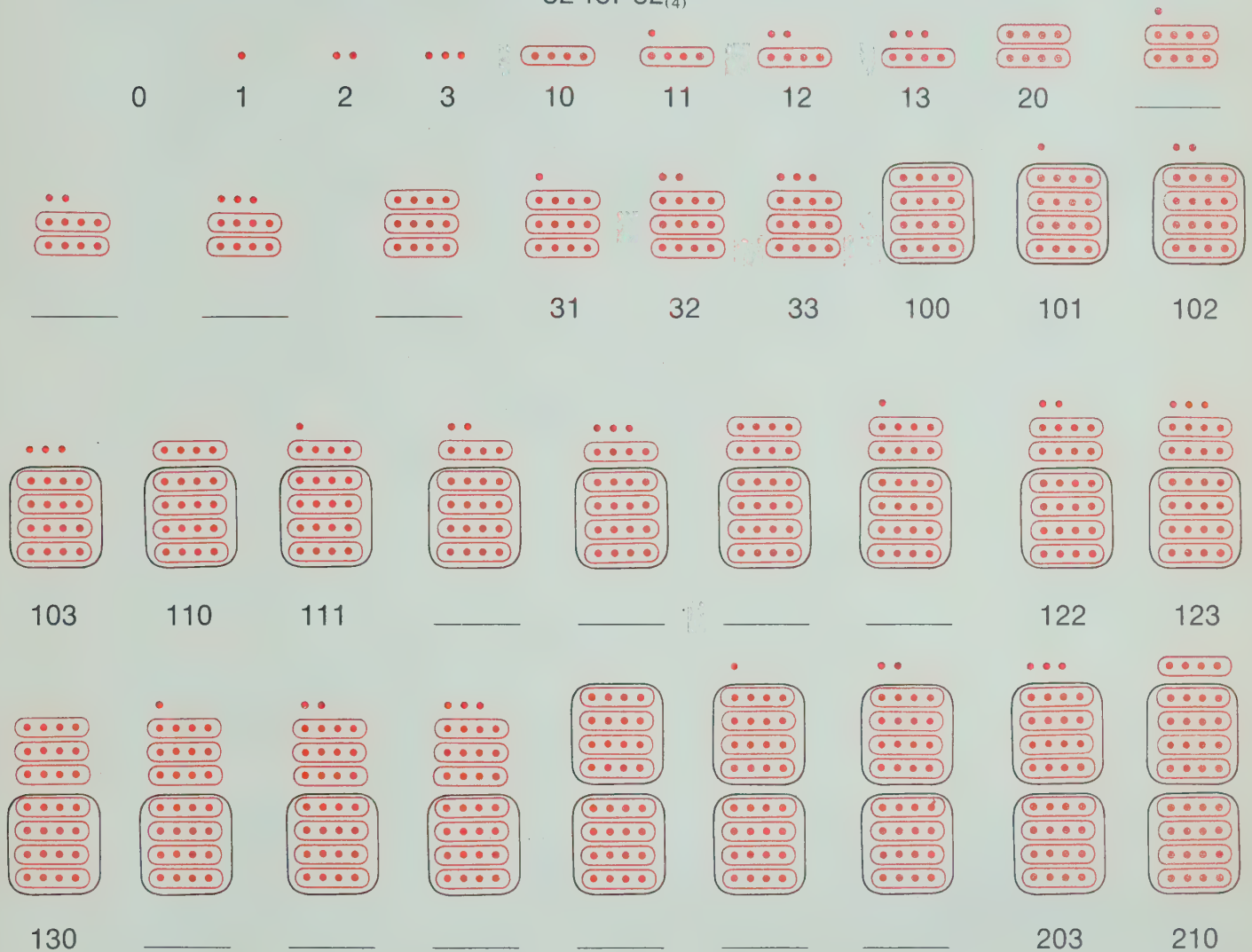
_____ < _____

● Counting in Base Four

1. Study the counting sequence below to see how any number of dots can be written using only the digits 0, 1, 2, and 3. Give the missing numerals. For these exercises you may omit the base-four notation beside the numerals.

For example, we will write

32 for $32_{(4)}$

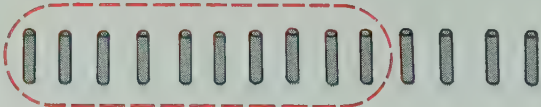


2. Do you see the counting pattern? Can you count farther without the sets of dots?

_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____


● Other Bases for Numerals

1. Draw rings to group the sticks as indicated. Then fill in the blanks.

A In base ten group by **tens**:  _____ tens and _____
We write _____

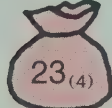
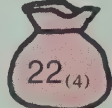


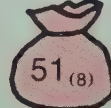







B In base four group by **fours**:  _____ fours and _____
We write _____ ₍₄₎

C In base six group by **sixes**:  _____ sixes and _____
We write _____ ₍₆₎

D In base five group by **fives**:  _____ fives and _____
We write _____ ₍₅₎

E In base eight group by **eights**:  _____ eights and _____
We write _____ ₍₈₎

2. Think of each sack as containing marbles. The number of marbles is given in a base other than ten. Give the base ten numeral for each one.

A		B		C		D		E		F	
	_____		_____		_____		_____		_____		_____
G		H		I		J		K		L	
	_____		_____		_____		_____		_____		_____



● Computing in Another Base

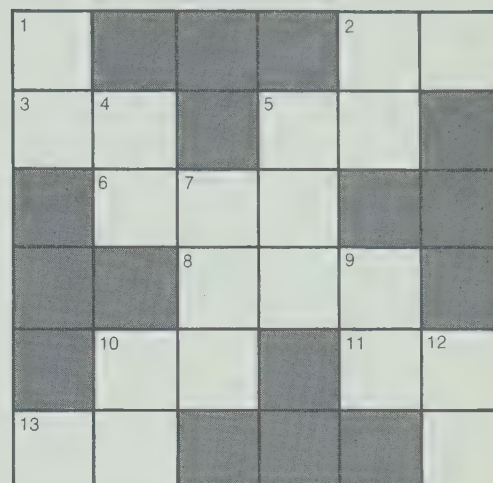
1. This is a base 4 puzzle. Give all your answers in base 4 without the $_{(4)}$.
For example, write 32 instead of $32_{(4)}$.

Across

2. largest 2-digit numeral
3. $3_{(4)} \times 3_{(4)}$
5. 1 four and 2
6. thirty-six
8. half a hundred
10. ten
11. a nickel is cents
13. noon

Down

1. $3_{(4)} + 3_{(4)}$
2. $2_{(4)} \times 13_{(4)}$
4. half a dozen
5. 4 fours
7. $3_{(4)} \times 22_{(4)}$
9. area: 
10. 
12. $2_{(4)} + 3_{(4)} + 2_{(4)}$





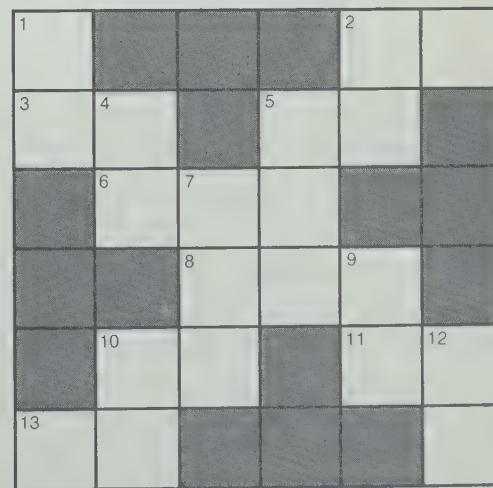
2. This is a base 5 puzzle. Give all your answers in base 5 without the $_{(5)}$.
For example, write 24 instead of $24_{(5)}$.

Across

2. $3_{(5)} + 3_{(5)}$
3. 2 sevens
5. half dozen
6. thirty
8. fifty-one
10. $2_{(5)} \times 2_{(5)} \times 2_{(5)}$
11. $4_{(5)} \times 4_{(5)}$
13. largest 2-digit numeral

Down

1. dozen
2. $2_{(5)} \times 3_{(5)}$
4. 3 sevens
5. area: 
7. thirty-eight
9. $4_{(5)} + 4_{(5)}$
10. 0, 1, 4, , 16, 25, . . .
12. 



Using Different Symbols

Suppose you used some different symbols for base 4 numerals. Try the counting and computing using the new symbols in the box.

$$0_{(4)} = a$$

$$1_{(4)} = b$$

$$2_{(4)} = c$$

$$3_{(4)} = d$$

1. Complete the counting. Hint: Your work on page 9 should help you.

a, b, c, d, ba, bb, bc, bd, ca, _____, _____, _____, _____,

_____, _____, _____, _____, _____, _____, _____.

2. Complete each table.

+	a	b	c	d
a	a	b	c	d
b	b	c		
c	c			bb
d	d	ba		

×	a	b	c	d
a	a	a	a	a
b	a	b	c	d
c	a	c		bc
d	a	d		

3. Solve.

A b c
+ b

B b c
+ c

C b c
+ d

D d c
+ b

E d c
+ c

F d c
+ d

G b c
× b

H b c
× c

I b c
× d

J c a
× b

K c a
× c

L c a
× d

4. Make up some symbols of your own for base 5.
Try some counting and computing.

$$0_{(5)} = \underline{\hspace{2cm}}$$

$$1_{(5)} = \underline{\hspace{2cm}}$$

$$2_{(5)} = \underline{\hspace{2cm}}$$

$$3_{(5)} = \underline{\hspace{2cm}}$$

$$4_{(5)} = \underline{\hspace{2cm}}$$

The number 2 can be written as a sum in just one way.
We won't use 0 as an addend on this page.

$$2 = 1 + 1$$

The number 3 can be written as a sum in 3 ways.

$$3 = 2 + 1$$

$$3 = 1 + 2$$

$$3 = 1 + 1 + 1$$

The number 4 can be written as a sum in 7 ways.

$$4 = 3 + 1$$

$$4 = 2 + 1 + 1$$

$$4 = 1 + 1 + 1 + 1$$

$$4 = 1 + 3$$

$$4 = 1 + 2 + 1$$

$$4 = 2 + 2$$

$$4 = 1 + 1 + 2$$

1. How many ways can you write 5 as a sum?

Some examples are given to get you started.

2 addends

$$5 = 4 + 1$$

$$5 = 1 + 4$$

3 addends

$$5 = 3 + 1 + 1$$

$$5 = 1 + 3 + 1$$

4 addends

$$5 = 2 + 1 + 1 + 1$$

5 addends

$$5 =$$

Keep trying. There are 15 ways altogether.

2. How many ways can you find to write 6 as a sum? Organize your work carefully—there are 31.

Note: Would you believe 7 has 63 ways, 8 has 127 ways, and 9 has 255 ways?

● Repeated Subtraction

You can “get to zero” by subtracting ones, twos, threes, fours, sixes, or twelve from 12. You can’t get to zero by subtracting fives. Try it in the space below.

$\begin{array}{r} 12 \\ - 2 \\ \hline 10 \\ - 2 \\ \hline 8 \\ - 2 \\ \hline 6 \\ - 2 \\ \hline 4 \\ - 2 \\ \hline 2 \\ - 2 \\ \hline 0 \end{array}$	$\begin{array}{r} 12 \\ - 3 \\ \hline 9 \\ - 3 \\ \hline 6 \\ - 3 \\ \hline 3 \\ - 3 \\ \hline 0 \end{array}$	$\begin{array}{r} 12 \\ - 4 \\ \hline 8 \\ - 4 \\ \hline 4 \\ - 4 \\ \hline 0 \end{array}$	$\begin{array}{r} 12 \\ - 6 \\ \hline 6 \\ - 6 \\ \hline 0 \end{array}$	$\begin{array}{r} 12 \\ - 12 \\ \hline 0 \end{array}$
--	---	--	---	---

For each number below, how many different numbers can you find that will “get you to zero” by repeated subtraction.

30

42

60

144

Solving "Tricky" Equations

1. Try to solve these equations without doing any pencil-paper computing.

A $(6 \times 4) \div 4 = n$

$n = \underline{\hspace{2cm}}$

D $(63 \div 9) \times 9 = n$

$n = \underline{\hspace{2cm}}$

G $(322 \div 7) \times 7 = n$

$n = \underline{\hspace{2cm}}$

B $(9 \times 8) \div 8 = n$

$n = \underline{\hspace{2cm}}$

E $(17 \times 6) \div 6 = n$

$n = \underline{\hspace{2cm}}$

H $(0 \div 13) \times 13 = n$

$n = \underline{\hspace{2cm}}$

C $(48 \div 8) \times 8 = n$

$n = \underline{\hspace{2cm}}$

F $(38 \times 9) \div 9 = n$

$n = \underline{\hspace{2cm}}$

I $(483 \times 29) \div 29 = n$

$n = \underline{\hspace{2cm}}$

2. Now try these, but be careful.

A $(12 \times 4) \div 4 = n$

$n = \underline{\hspace{2cm}}$

D $(24 \times 6) \div 3 = n$

$n = \underline{\hspace{2cm}}$

G $(32 \div 4) \times 8 = n$

$n = \underline{\hspace{2cm}}$

B $(12 \times 4) \div 8 = n$

$n = \underline{\hspace{2cm}}$

E $(24 \times 6) \div 12 = n$

$n = \underline{\hspace{2cm}}$

H $(32 \div 8) \times 4 = n$

$n = \underline{\hspace{2cm}}$

C $(12 \times 4) \div 2 = n$

$n = \underline{\hspace{2cm}}$

F $(24 \times 3) \div 6 = n$

$n = \underline{\hspace{2cm}}$

I $(32 \times 4) \div 8 = n$

$n = \underline{\hspace{2cm}}$

3. Are you ready? Now try these.

A $(6 \times 3) \div n = 6$

$n = \underline{\hspace{2cm}}$

E $(8 \times 4) \div n = 8$

$n = \underline{\hspace{2cm}}$

I $(24 \div n) \times 6 = 24$

$n = \underline{\hspace{2cm}}$

B $(12 \times 4) \div n = 12$

$n = \underline{\hspace{2cm}}$

F $(8 \times 4) \div n = 16$

$n = \underline{\hspace{2cm}}$

J $(24 \div n) \times 6 = 48$

$n = \underline{\hspace{2cm}}$

C $(23 \times n) \div 5 = 23$

$n = \underline{\hspace{2cm}}$

G $(8 \times 4) \div n = 4$

$n = \underline{\hspace{2cm}}$

K $(24 \div n) \times 6 = 12$

$n = \underline{\hspace{2cm}}$

D $(47 \times n) \div 8 = 47$

$n = \underline{\hspace{2cm}}$

H $(8 \times 4) \div n = 32$

$n = \underline{\hspace{2cm}}$

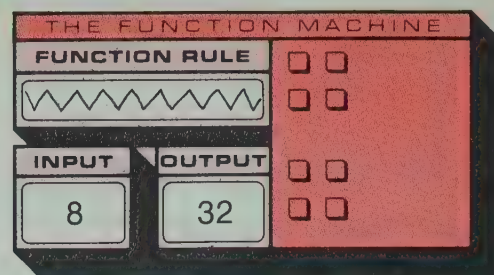
L $(24 \div n) \times 6 = 72$

$n = \underline{\hspace{2cm}}$

● A "Broken" Function Machine

Since the rule screen is out of order on this function machine, you do not have to give a rule.

Show you know each rule by giving the missing numbers in the tables below. Each table has a different rule.



1. Function Rule

Input	Output
7	49
6	42
9	63
5	
8	
4	

2. Function Rule

Input	Output
12	2
38	8
543	3
627	
487	
56	

3. Function Rule

Input	Output
4	0
3	5
6	0
5	5
7	
8	

4. Function Rule

Input	Output
3	6
4	8
5	0
6	2
7	4
8	

5. Function Rule

Input	Output
2	6
3	9
4	2
5	5
6	8
7	

6. Function Rule

Input	Output
1	4
2	8
3	2
4	6
5	
6	

7. Function Rule

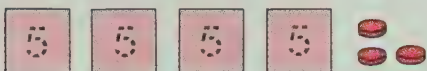
Input	Output
5	0
3	8
6	6
2	2
7	2
4	

8. Function Rule

Input	Output
2	8
8	2
3	7
5	5
6	
4	

● Finding an Unknown Number

1. In each part, each card covers the same number of discs.
Write the hidden number of discs on the card.

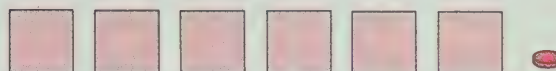
A 
23 discs in all


B 
24 discs in all

C 
36 discs in all




D 
32 discs in all



E 
30 discs in all



F 
43 discs in all

G 
42 discs in all


H 
40 discs in all



2. In these exercises, 3  will mean the same as showing 3 cards. For example, part A above would be shown as 4  and . Again write the unknown number on the card.



A 3  and 
23 in all

B 6  and 
45 in all

C 5  and 
44 in all

D 7  and 
51 in all


E 9  and 
55 in all


F 8  and 
75 in all


3. The example below shows a new way to write the examples above.


4  and  \longrightarrow 4  + 5 = 29
29 in all

Write the unknown number on the box.


A 6  + 3 = 33

D 5  + 8 = 58

G 3  + 7 = 40

J 9  + 7 = 61

B 7  + 6 = 48

E 9  + 5 = 68

H 7  + 4 = 60

K 6  + 12 = 30

C 4  + 8 = 44

F 8  + 6 = 70

I 5  + 9 = 49

L 8  + 15 = 31

● Solving Equations

On this page, letters will be used in place of cards.

$$4 \boxed{5} + 6 = 26 \longrightarrow 4n + 6 = 26$$

$$n = 5$$

Also you can think of $4n - 6$ as meaning 6 discs less than those under the cards.

1. Solve the equations.

A $6x + 5 = 29$

$x = \underline{4}$

F $3m - 4 = 26$

$m = \underline{\hspace{2cm}}$

K $6t + 1 = 19$

$t = \underline{\hspace{2cm}}$

P $8p - 12 = 20$

$p = \underline{\hspace{2cm}}$

B $5t - 3 = 32$

$t = \underline{7}$

G $9a - 1 = 80$

$a = \underline{\hspace{2cm}}$

L $8d - 2 = 38$

$d = \underline{\hspace{2cm}}$

Q $7t + 25 = 32$

$t = \underline{\hspace{2cm}}$

C $4n + 1 = 33$

$n = \underline{\hspace{2cm}}$

H $5n + 4 = 39$

$n = \underline{\hspace{2cm}}$

M $6a - 6 = 6$

$a = \underline{\hspace{2cm}}$

R $9b + 7 = 7$

$b = \underline{\hspace{2cm}}$

D $5b - 2 = 28$

$b = \underline{\hspace{2cm}}$

I $8s + 10 = 82$

$s = \underline{\hspace{2cm}}$

N $7c + 8 = 29$

$c = \underline{\hspace{2cm}}$

S $10c + 4 = 34$

$c = \underline{\hspace{2cm}}$

E $9r + 5 = 50$

$r = \underline{\hspace{2cm}}$

J $7y - 10 = 18$

$y = \underline{\hspace{2cm}}$

O $5n - 5 = 0$

$n = \underline{\hspace{2cm}}$

T $12m - 8 = 40$

$m = \underline{\hspace{2cm}}$

2. Solve the equations.

A $2n = n + 6$

$n = \underline{6}$

E $3n = n + 8$

$n = \underline{\hspace{2cm}}$

I $6x = 3x + 12$

$x = \underline{\hspace{2cm}}$

M $2n + 3 = n + 5$

$n = \underline{\hspace{2cm}}$

B $2r = r + 8$

$r = \underline{\hspace{2cm}}$

F $4a = 2a + 12$

$a = \underline{\hspace{2cm}}$

J $5y = y + 20$

$y = \underline{\hspace{2cm}}$

N $3r + 2 = r + 8$

$r = \underline{\hspace{2cm}}$

C $3s = 2s + 5$

$s = \underline{\hspace{2cm}}$

G $5c = 3c + 10$

$c = \underline{\hspace{2cm}}$

K $7m = m + 12$

$m = \underline{\hspace{2cm}}$

O $5y + 1 = 2y + 13$

$y = \underline{\hspace{2cm}}$

D $5t = 4t + 7$

$t = \underline{\hspace{2cm}}$

H $7d = 5d + 4$

$d = \underline{\hspace{2cm}}$

L $8s = 3s + 15$

$s = \underline{\hspace{2cm}}$

P $8g + 3 = 3g + 28$

$g = \underline{\hspace{2cm}}$

● Area and Graphs

1. You can think of point A as one corner of a rectangular region. Using the units of the graph, what is the area of the

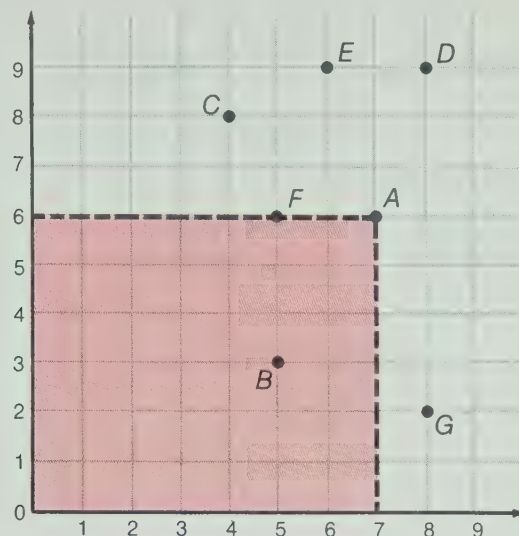
region? _____

2. What is the area of the rectangle having one corner as point

B? _____ E? _____

C? _____ F? _____

D? _____ G? _____



3. What is the area of the rectangle given by each of these points?

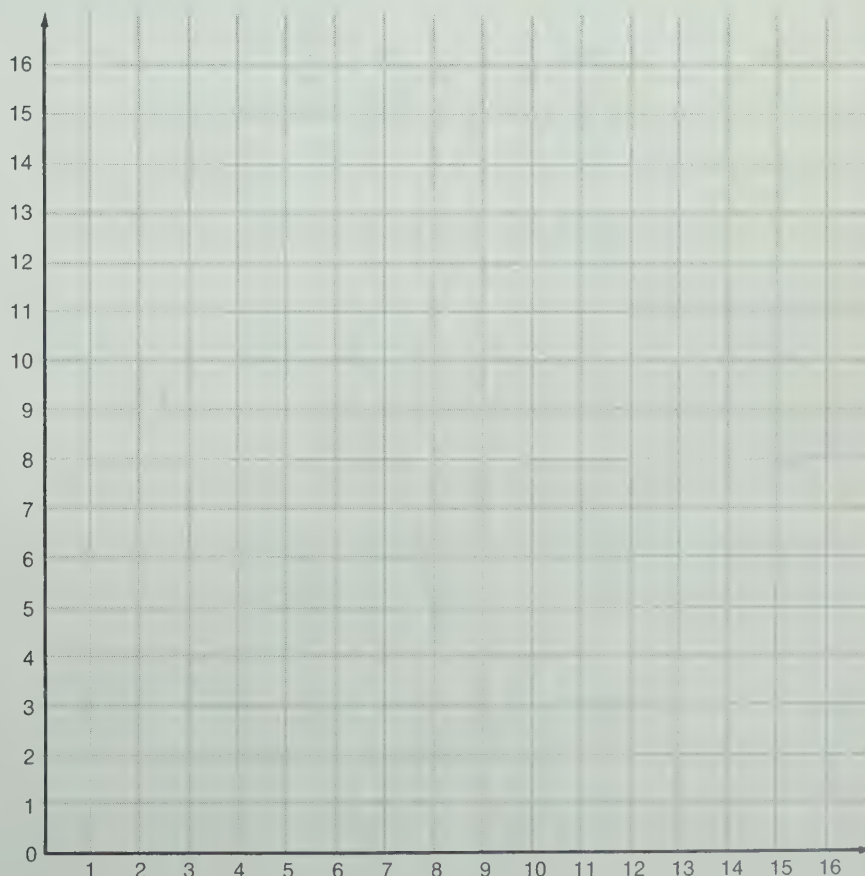
(5, 8) _____ (6, 7) _____ (8, 5) _____ (6, 6) _____

(9, 7) _____ (9, 8) _____ (7, 8) _____ (9, 9) _____

4. How many points can you find for rectangles that have area 24? Connect your points with a "smooth curve."

5. Repeat Exercise 4 for Area 48.

6. On a separate sheet of graph paper, try this for area 72.



● Using the Basic Principles

Using the clue cards, you can solve the problems below with very little work. Try them.

Remember, if you do much work, you may not be taking advantage of the cards.

$$\begin{array}{r} 1. \quad 284 \\ \times 67 \\ \hline \end{array}$$

$$\begin{array}{r} 2. \quad 79 \\ \times 24 \\ \hline \end{array}$$

$$\begin{array}{r} 3. \quad 89 \\ 43 \\ + 76 \\ \hline \end{array}$$

$$\begin{array}{r} 4. \quad 86 \\ \times 75 \\ \hline \end{array}$$

$$\begin{array}{r} 5. \quad 367 \\ \times 59 \\ \hline \end{array}$$

$$\begin{array}{r} 6. \quad 284 \\ \times 61 \\ \hline \end{array}$$

CLUE CARDS

$$\begin{array}{r} 368 \\ \times 59 \\ \hline 21,712 \end{array}$$

$$43 + 89 + 76 = 208$$

$$\begin{array}{r} 93 \\ \times 8 \\ \hline 744 \end{array}$$

$$\begin{array}{r} 65 \\ \times 40 \\ \hline 2600 \end{array}$$

$$\begin{array}{r} 73 \\ \times 35 \\ \hline 2555 \end{array}$$

$$\begin{array}{r} 64 \\ \times 4 \\ \hline 256 \end{array}$$

$$\begin{array}{r} 68 \\ \times 33 \\ \hline 2244 \end{array}$$

$$284 \times 7 = 1988$$

$$53 \times (40 + 7) = 2491$$

$$79 \times 4 \times 6 = 1896$$

$$\begin{array}{r} 93 \\ \times 70 \\ \hline 6510 \end{array}$$

$$\begin{array}{r} 284 \\ \times 60 \\ \hline 17,040 \end{array}$$

$$76 + 76 + 76 = 228$$

$$86 \times 75 = 6450$$

$$7. \quad 75 \times 86 = n$$

$$n = \underline{\hspace{2cm}}$$

$$8. \quad 24 \times 79 = n$$

$$n = \underline{\hspace{2cm}}$$

$$9. \quad 368 \times 59 = n$$

$$n = \underline{\hspace{2cm}}$$

$$10. \quad 73 \times (30 + 5) = n$$

$$n = \underline{\hspace{2cm}}$$

$$11. \quad 64 + 64 + 64 + 65 = n$$

$$n = \underline{\hspace{2cm}}$$

$$12. \quad 47 \times (50 + 3) = n$$

$$n = \underline{\hspace{2cm}}$$

$$\begin{array}{r} 13. \quad 65 \\ \times 44 \\ \hline \end{array}$$

$$\begin{array}{r} 14. \quad 93 \\ \times 78 \\ \hline \end{array}$$

$$\begin{array}{r} 15. \quad 76 \\ \times 3 \\ \hline \end{array}$$

$$16. \quad 64 \times 8 = n$$

$$n = \underline{\hspace{2cm}}$$

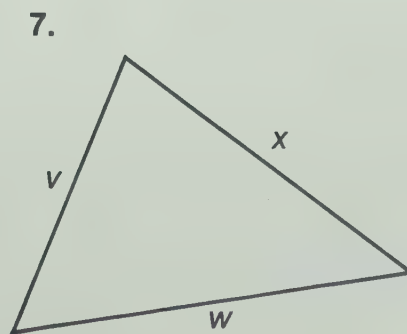
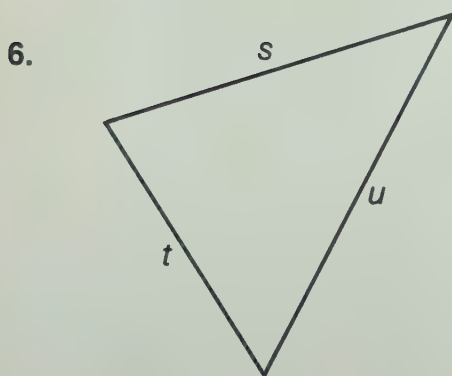
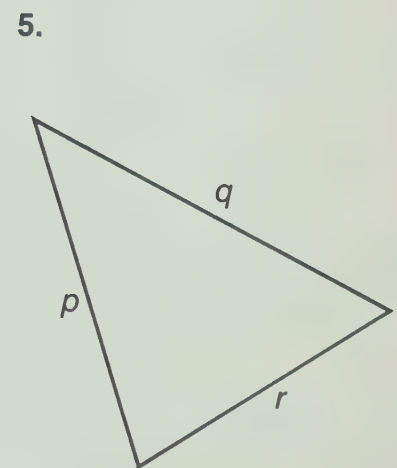
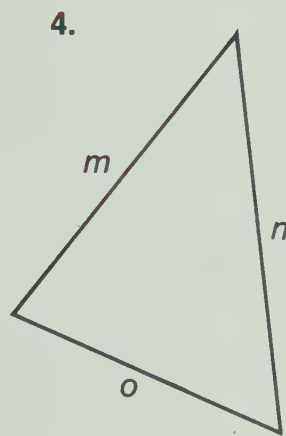
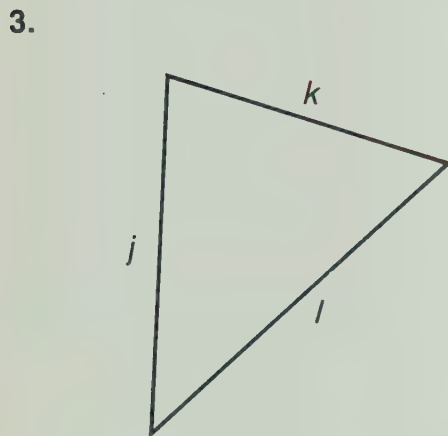
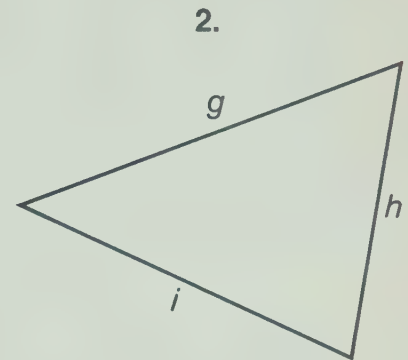
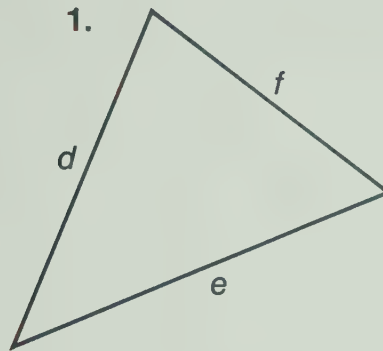
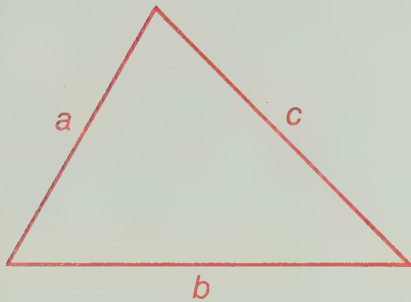
$$17. \quad 32 \times 68 = n$$

$$n = \underline{\hspace{2cm}}$$

$$18. \quad 35 \times (70 + 3) = n$$

$$n = \underline{\hspace{2cm}}$$

Each triangle has one side that is congruent to a , one side congruent to b , and one side congruent to c . See if you can find and record them below.



The segments congruent to a _____

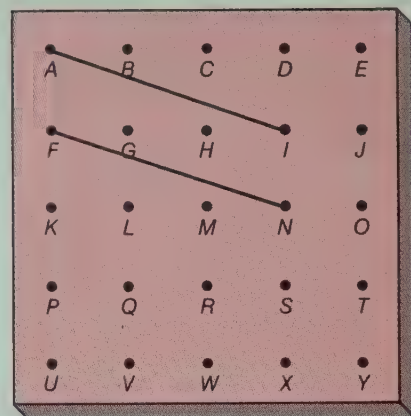
The segments congruent to b _____

The segments congruent to c _____

● Parallel and Perpendicular Segments

1. Segment \overline{FN} is parallel to segment \overline{AI} . How many other segments can you find and draw on the geoboard that are parallel to \overline{AI} ?

Name them: \overline{FN} , _____

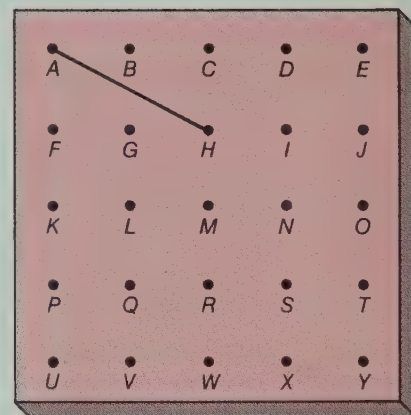


2. **A** How many segments can you find that are **both** parallel and congruent to \overline{AH} ?

Name them: _____

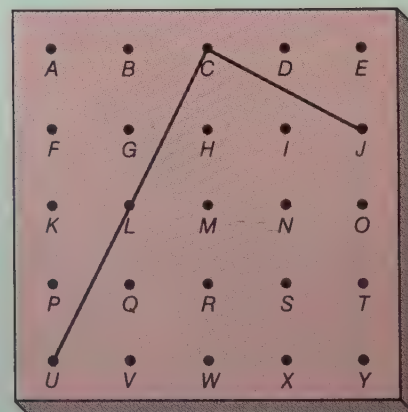
- B** Can you find and name some segments that are parallel to \overline{AH} , but **not** congruent to \overline{AH} ?

Name them: _____



3. Segment \overline{CJ} is perpendicular to segment \overline{CU} . How many other segments perpendicular to \overline{CU} can you find and draw on this geoboard? (Assume that perpendicular segments touch each other.)

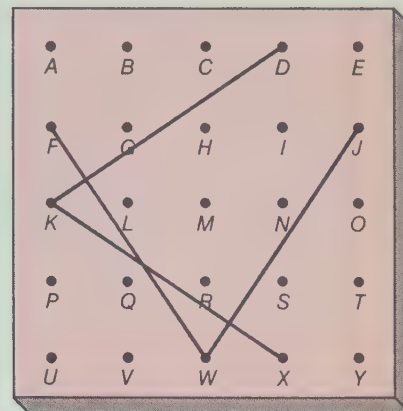
Name them: \overline{CJ} , _____



● Congruent Angles

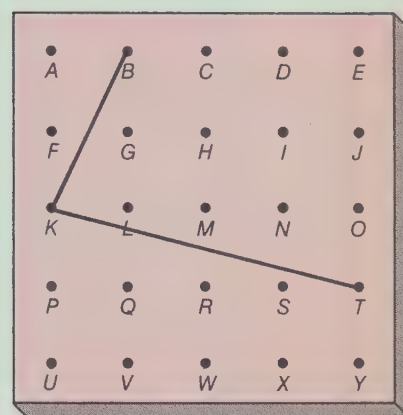
1. Angle FWJ is congruent to angle DKX .
How many other angles can you find and draw on the geoboard that are congruent to $\angle DKX$?

Name them: $\angle FWJ$, _____



2. How many angles can you draw on the geoboard that are congruent to $\angle BKT$?

Name them: _____

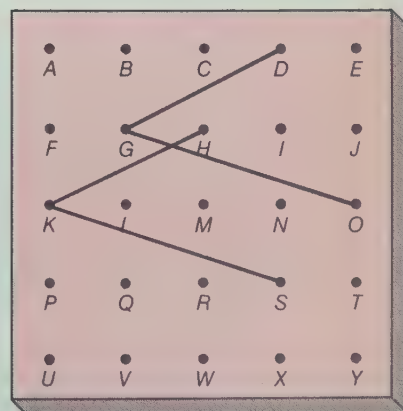


3. **A** $\angle DGO$ is congruent to $\angle HKS$.
Also, the sides of the two angles are parallel. How many other such angles (parallel sides) can you draw on the geoboard?

Name them: $\angle DGO$ _____

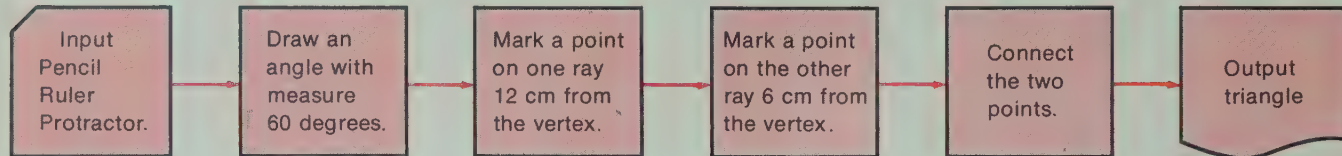
- B** Can you find 5 other angles that are congruent (but not parallel sides) to $\angle HKS$?

Name them: _____



● Angle Measure

1. Can you use the flow chart to draw a triangle in the space below?



Put the point
of the angle
(vertex) here

2. Measure the other two angles. _____

If you did your work carefully, their measures should be about 90 degrees and 30 degrees.

3. Find the sum of the degree measures of the three angles. _____

Your result should be very close to 180 degrees.

4. Draw any large triangle on another sheet _____

of paper. Record the measure of the angles. _____

Find the sum _____

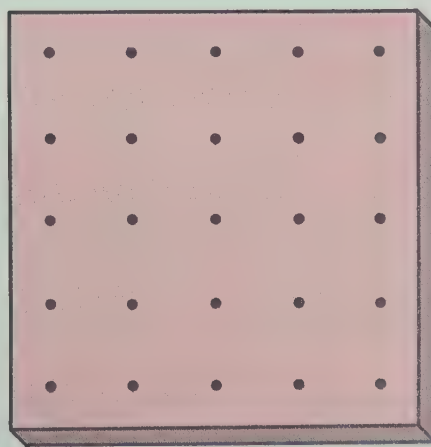
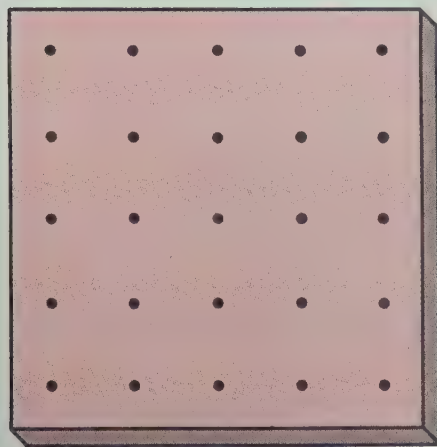
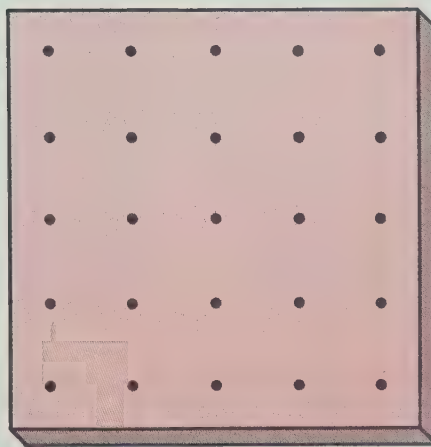
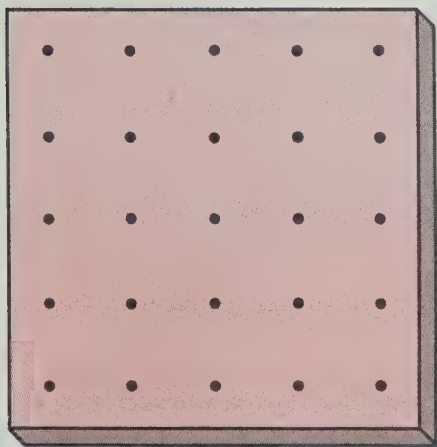
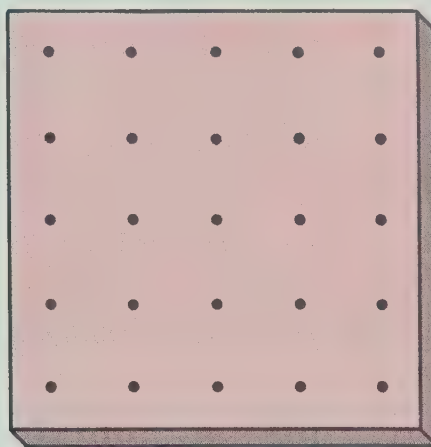
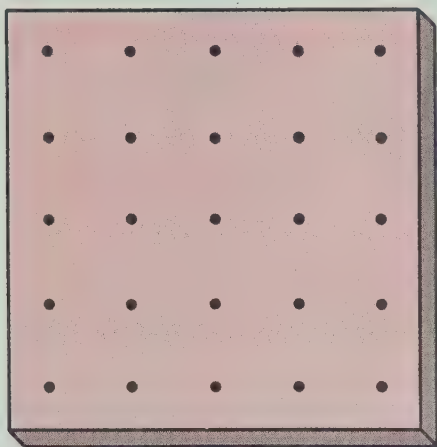
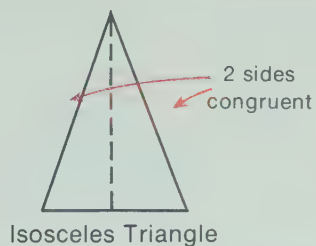
The sum should be very close to 180 degrees. _____

● Symmetric Figures

An isosceles triangle is a symmetrical figure.

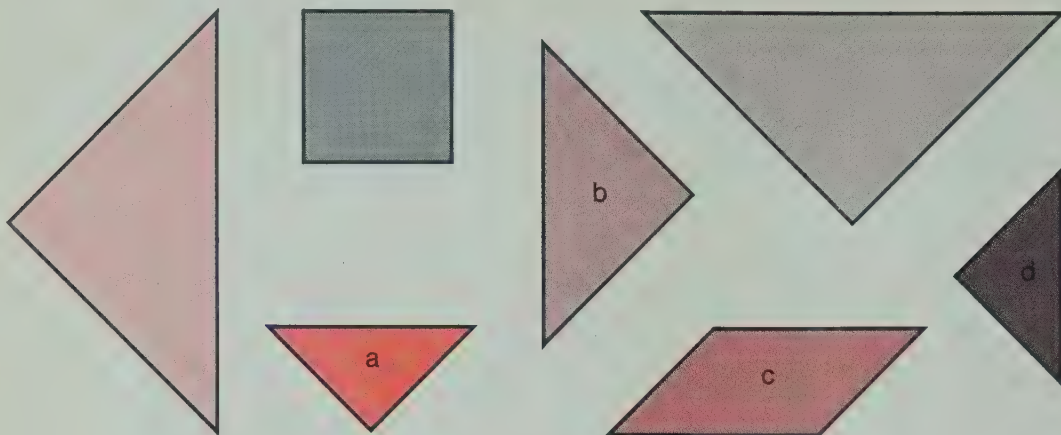
How many different shaped isosceles triangles can you find and draw on the geoboards below?

Don't quit too soon; there are 22.

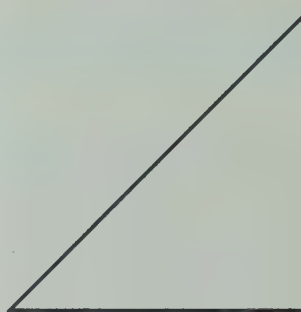
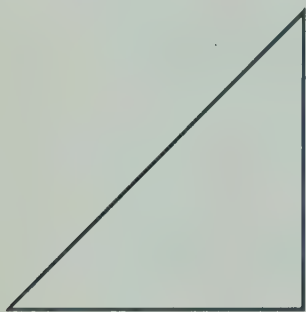


●Forming Congruent Figures

These are the 7 pieces of the tangram puzzle.

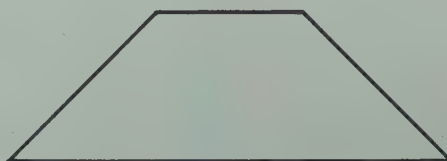


1. How many ways can you use the 5 small pieces to form a figure that is congruent to one of the large triangles? Record your findings by drawing the figures in the large triangles below.



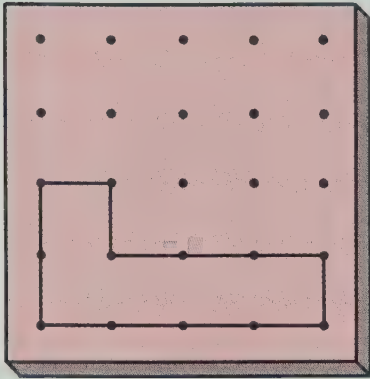
2. Can you use pieces a, b, c, and d to form two congruent figures? Show how you did it in the space below.

3. Using the 5 small pieces, form a pair of congruent isosceles trapezoids. Record how you did it in the two isosceles trapezoids below.

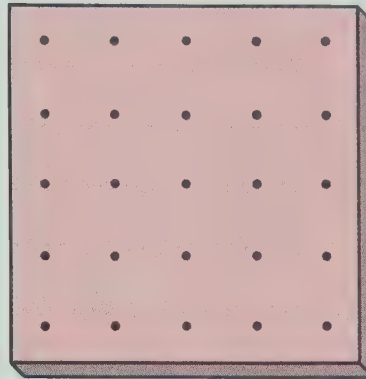


● Perimeter and Area

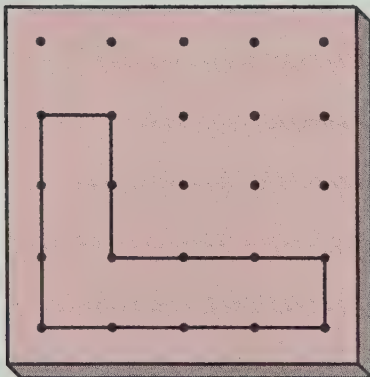
1. The perimeter of this figure is 12 units. Its area is 5 square units.



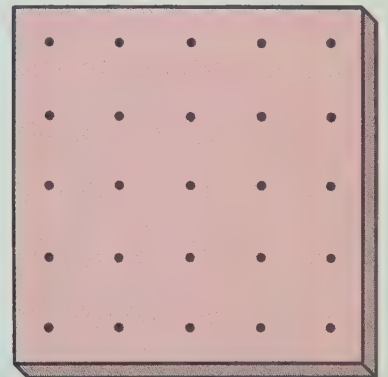
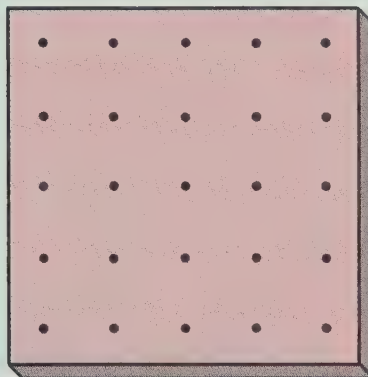
Can you show a figure on this geoboard that has perimeter 10 and area 5?



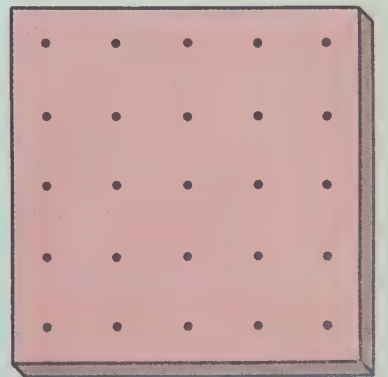
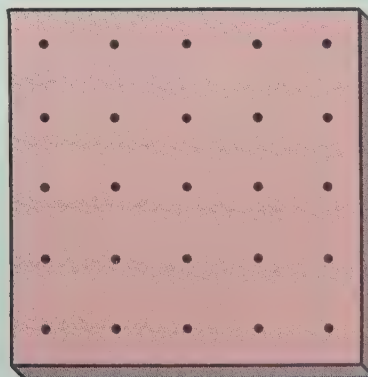
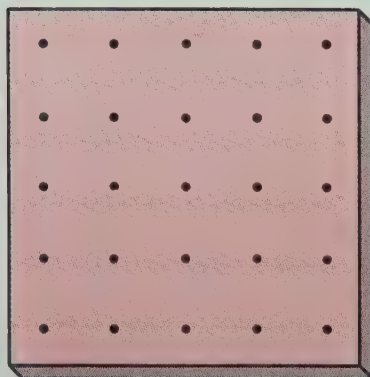
2. The area of this figure is 6 square units and its perimeter is 14.



Can you show two other figures with area 6 but different perimeters?



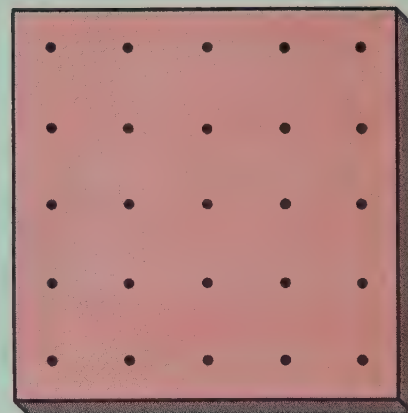
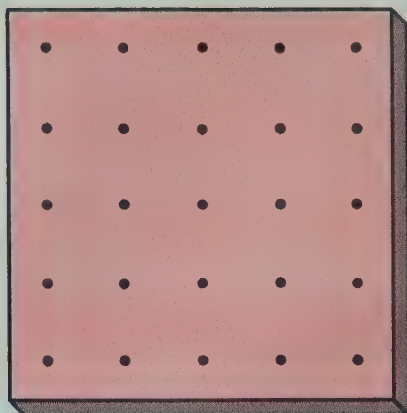
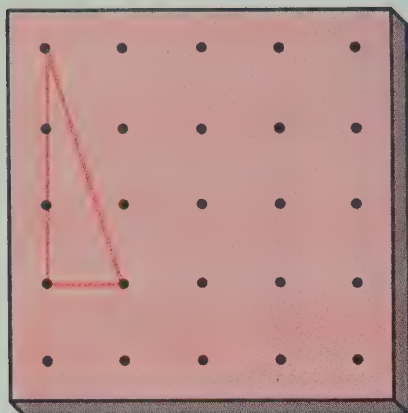
3. How many different perimeters can you show for figures that all have area 8? Four different ones are possible.



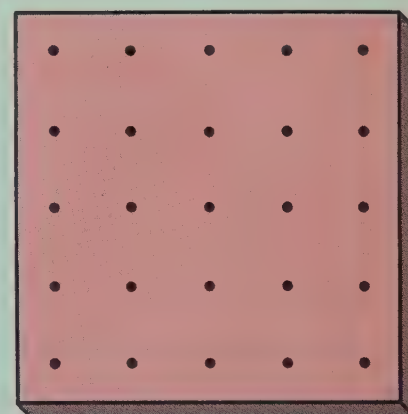
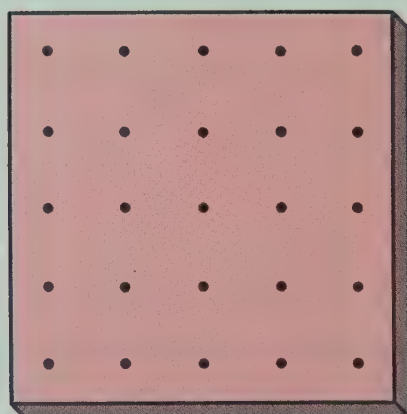
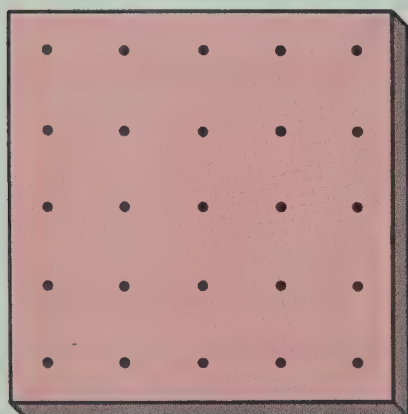
4. Try Exercise 3 for an area of 9 on another sheet of paper with 5×5 sets of dots.

● Area of Triangles on the Geoboard

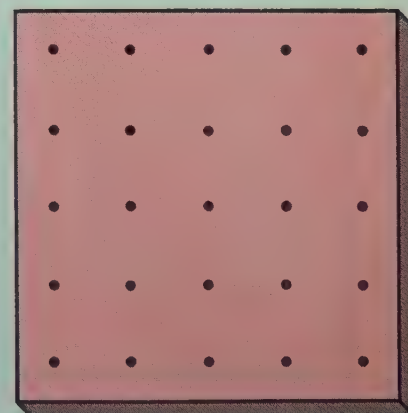
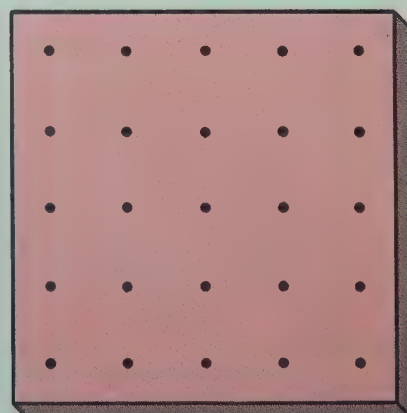
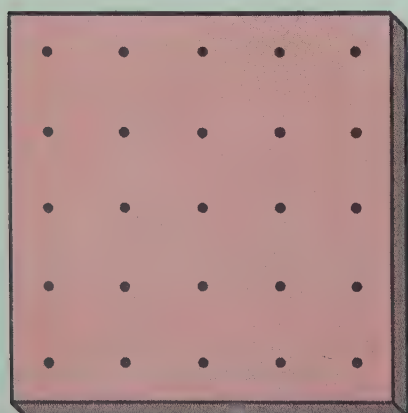
1. Using the dots as corners, how many different shaped triangles can you show that have no dots inside? Give the area of each one.



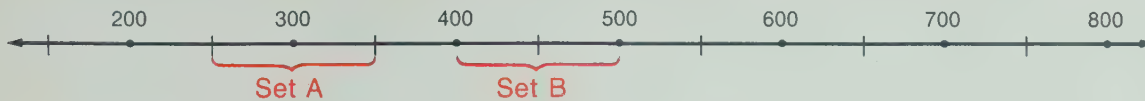
2. How many different shaped triangles can you show that have exactly one dot inside? Give the area of each one.



3. All the triangles that touch only 3 dots (on the corners only) have area $\frac{1}{2}$. How many of them can you find? (There are 6).

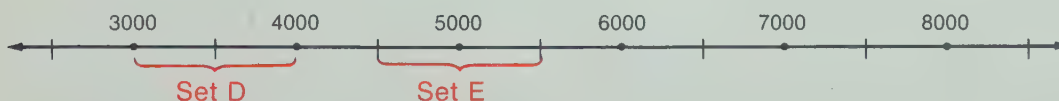


1. The numbers in set A are between 250 and 350. The numbers in set B are between 400 and 500.



- a** List five numbers in Set A. _____
- b** List five numbers in Set B. _____
- c** Give these numbers: largest in A _____; smallest in B _____;
largest in B _____; smallest in A _____.
- d** Make up some addition problems using one number from A and one from B in each problem. Estimate the sums.
- | | | | | | | |
|---------------|---|--|---|--|---|--|
| From A | → | <div style="border: 1px solid black; width: 50px; height: 20px; background-color: #f0f0f0;"></div> | + | <div style="border: 1px solid black; width: 50px; height: 20px; background-color: #f0f0f0;"></div> | = | <div style="border: 1px solid black; width: 50px; height: 20px; background-color: #f0f0f0;"></div> |
| From B | → | <div style="border: 1px solid black; width: 50px; height: 20px; background-color: #f0f0f0;"></div> | + | <div style="border: 1px solid black; width: 50px; height: 20px; background-color: #f0f0f0;"></div> | = | <div style="border: 1px solid black; width: 50px; height: 20px; background-color: #f0f0f0;"></div> |
| Estimated Sum | → | <div style="border: 1px solid black; width: 50px; height: 20px; background-color: #f0f0f0;"></div> | | <div style="border: 1px solid black; width: 50px; height: 20px; background-color: #f0f0f0;"></div> | | <div style="border: 1px solid black; width: 50px; height: 20px; background-color: #f0f0f0;"></div> |
- e** What is the smallest sum you could get by adding one number from A and one from B? _____
- f** What is the largest such number? _____
- g** Use a colored pencil to show a set C on the number line above that contains all possible sums like those in Part D.

2. The numbers in Set D are between 3000 and 4000. The numbers in Set E are between 4500 and 5500.



- a** Make up some problems as you did in 1D above.
- | | | | | | | |
|---------------|---|--|---|--|---|--|
| From D | → | <div style="border: 1px solid black; width: 50px; height: 20px; background-color: #f0f0f0;"></div> | + | <div style="border: 1px solid black; width: 50px; height: 20px; background-color: #f0f0f0;"></div> | = | <div style="border: 1px solid black; width: 50px; height: 20px; background-color: #f0f0f0;"></div> |
| From E | → | <div style="border: 1px solid black; width: 50px; height: 20px; background-color: #f0f0f0;"></div> | + | <div style="border: 1px solid black; width: 50px; height: 20px; background-color: #f0f0f0;"></div> | = | <div style="border: 1px solid black; width: 50px; height: 20px; background-color: #f0f0f0;"></div> |
| Estimated Sum | → | <div style="border: 1px solid black; width: 50px; height: 20px; background-color: #f0f0f0;"></div> | | <div style="border: 1px solid black; width: 50px; height: 20px; background-color: #f0f0f0;"></div> | | <div style="border: 1px solid black; width: 50px; height: 20px; background-color: #f0f0f0;"></div> |
- b** Show a Set F on the number line that contains all possible sums like those from part A.

● Special Products

1. Give missing factors in the equations. Make all equations different.

A _____ \times _____ = 1500 **B** _____ \times _____ = 2800 **C** _____ \times _____ = 5400

_____ \times _____ = 1500 _____ \times _____ = 2800 _____ \times _____ = 5400

D _____ \times _____ = 2400 **E** _____ \times _____ = 1200 **F** _____ \times _____ = 3000

_____ \times _____ = 2400 _____ \times _____ = 1200 _____ \times _____ = 3000

_____ \times _____ = 2400 _____ \times _____ = 1200 _____ \times _____ = 3000

_____ \times _____ = 2400 _____ \times _____ = 1200 _____ \times _____ = 3000

G _____ \times _____ = 18,000 **H** _____ \times _____ = 36,000 **I** _____ \times _____ = 40,000

_____ \times _____ = 18,000 _____ \times _____ = 36,000 _____ \times _____ = 40,000

_____ \times _____ = 18,000 _____ \times _____ = 36,000 _____ \times _____ = 40,000

_____ \times _____ = 18,000 _____ \times _____ = 36,000 _____ \times _____ = 40,000

_____ \times _____ = 18,000 _____ \times _____ = 36,000 _____ \times _____ = 40,000

_____ \times _____ = 18,000 _____ \times _____ = 36,000 _____ \times _____ = 40,000

2. Give missing numbers in the tables.

A

\times			7	
4000	28,000,000	280,000		2,800,000
	28,000		28	2800
	2,800,000		2800	
40		2800	280	28,000

B

\times		5		
	350,000		35,000	
		35,000		350,000
		35		
	3,500,000			35,000

● Special Quotients

1. Give missing numbers in the equations. Make all equations different.

A $1400 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$ **B** $3500 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$ **C** $7200 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

$1400 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$ $3500 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$ $7200 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

D $1800 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$ **E** $2400 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$ **F** $3600 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

$1800 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$ $2400 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$ $3600 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

$1800 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$ $2400 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$ $3600 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

$1800 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$ $2400 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$ $3600 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

G $12,000 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$ **H** $30,000 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$ **I** $48,000 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

$12,000 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$ $30,000 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$ $48,000 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

$12,000 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$ $30,000 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$ $48,000 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

$12,000 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$ $30,000 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$ $48,000 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

$12,000 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$ $30,000 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$ $48,000 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

$12,000 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$ $30,000 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$ $48,000 \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

2. Give missing numbers in the tables.

A

×						
		2000			1800	12,000
50	2000			1500		
	12,000	30,000	1800		27,000	
				120		2400

B

×				300		
		400				32,000
	18,000					800,000
		1000		6000		
	5400		4200		480	

● Making Estimation Problems

An answer to each estimation problem is given first. You are to put numbers in the problem that make sense and make the answer a “good” estimate.

1. **Answer:** About 35,000 nuts.

There are _____ nuts in each basket. How many nuts are there in all _____ baskets?

2. **Answer:** About \$120,000.

Jim Jones earns _____ dollars a month. At this rate, how much will he earn in _____ years?

3. **Answer:** 100,000 minutes.

Terri practiced the piano _____ minutes a day for _____ years. How many minutes was this in all?

4. **Answer:** About a million calories.

Many people eat about _____ calories a day. How many calories is this in a year?

5. **Answer:** About 100,000 pages.
Judy figured she had read about

_____ books in her life. If the books averaged _____ pages each, how many pages had she read?

6. **Answer:** About 5 million minutes.
There are 525,600 minutes in a year.

If Fritz is _____ years old, how many minutes old is he?

7. **Answer:** About \$240,000.
The average cost of the cars in

the lot is _____ dollars. How much would all _____ cars be worth?

8. **Answer:** About 300,000 people.

The stadium holds _____ people. It was full for each of the _____ games. What was the total attendance?

9. **Answer:** About 20,000 kilometers

Juan walks about _____ kilometers each day. He is _____ years old. How far has he walked in his life?

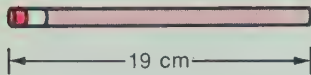
10. Make a problem of your own for the answer below.

Answer: About 150,000

● Estimating Metric Measures

Use the given fact to help you estimate each of the other measures using the given unit. Then, if you can, check to see how close you came.

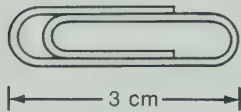
1. A new pencil is about 19 centimeters long.



- A How wide is your desk?
- B How tall are you?
- C How long is your pencil now?
- D How long is your room?
- E How tall is the door?

Estimate	Actual
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

2. An ordinary paper clip is about 3 centimeters long.



- A How thick is your math book?
- B How wide is your math book?
- C How far is it around your wrist?
- D How long is your shoe?
- E How wide is your hand?

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

3. It's about 950 kilometers from Chicago to Washington.



- A How far is it from Chicago to Boston?
- B How far is it from Chicago to New York?
- C How far is it from New York to Washington?
- D How far is it from New York to Boston?

_____	_____
_____	_____
_____	_____
_____	_____

4. A nickel weighs about 5 grams.



- A How much does a penny weigh? (Be careful!)
- B How much does a chalkboard eraser weigh?
- C How much does a small paper clip weigh?
- D How much does your ruler weigh?

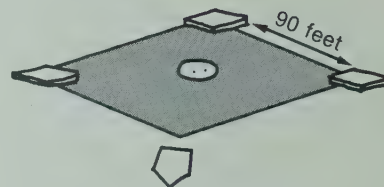
_____	_____
_____	_____
_____	_____
_____	_____

● Metric Measures in Sports

Many standard measures in sports are given in the English system of measure. Use the facts given to estimate the measures in metric units.

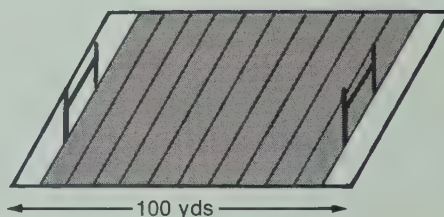
1. The distance between the bases in baseball is 90 feet. One meter is a little more than 3 feet.

Estimate the base distance in meters. _____



2. A football field is 100 yards long. 9 meters is almost 10 yards. Estimate the length of

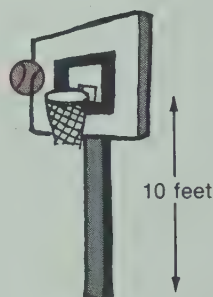
a football field in meters. _____



3. The height of the basket in basketball is 10 feet. There are about $30\frac{1}{2}$ centimeters in 1 foot. Estimate the basket height in

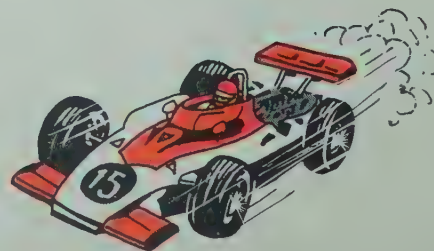
A meters. _____

B centimeters. _____



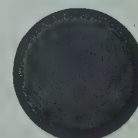
4. One of the most famous of all auto races is the Indianapolis 500. The cars race for 500 miles. There are about 8 kilometers for each 5 miles.

Estimate the length of the race in kilometers. _____



5. The standard weight for the Olympic shot put is 16 pounds. One kilogram is about $2\frac{1}{5}$ pounds. Estimate

the weight of the shot put in kilograms. _____



16 pounds

How many addition and subtraction problems can you write using numbers from this set .

Sample:

$$\begin{array}{r} 3293 \\ + 2687 \\ \hline 5980 \end{array}$$

3786 4392
2687 7426 3293
7079 5980 4089
3655 3771
7744

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● Adding and Subtracting with Metric Units

Adding and subtracting is much the same with meters and centimeters as it is with dollars and cents.

Complete the table.

Cents	Dollars	Cents	We write	We read
275	2	75	\$2.75	two dollars and seventy five cents
362	3			
429				

There are 100 cents in 1 dollar.
There 100 centimeters in 1 meter.

Now complete this table.

Centimeters	Meters	Centimeters	We write	We read
275	2	75	2.75 meters	two and seventy five hundredths meters
362	3			
429				

Note: For 2.75 meters, you can also read, "Two meters and 75 centimeters."

1. Find the totals.

A $\$3.46 + 3.46 \text{ meters}$
 $\underline{2.82} \quad \underline{2.82 \text{ meters}}$

B $\$5.27 + 5.27 \text{ meters}$
 $\underline{6.95} \quad \underline{6.95 \text{ meters}}$

C $\$3.85 + 3.85 \text{ meters}$
 $\underline{2.98} \quad \underline{2.98 \text{ meters}}$

2. Find the differences in the amounts.

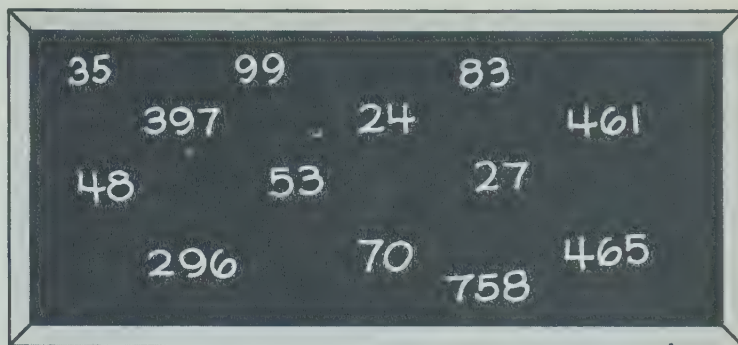
A $\$4.25 - 4.25 \text{ meters}$
 $\underline{1.75} \quad \underline{1.75 \text{ meters}}$

B $\$6.28 - 6.28 \text{ meters}$
 $\underline{1.35} \quad \underline{1.35 \text{ meters}}$

C $\$5.30 - 5.30 \text{ meters}$
 $\underline{2.89} \quad \underline{2.89 \text{ meters}}$

● Multiplying

Can you find the two factors for the multiplication problems below. They are all on the chalkboard. Look for clues such as: The product of two odd numbers is odd; a factor ending in 5 will have a product ending in 5 or 0; the product of two 2-digit numbers can't have more than 4 digits—etc.



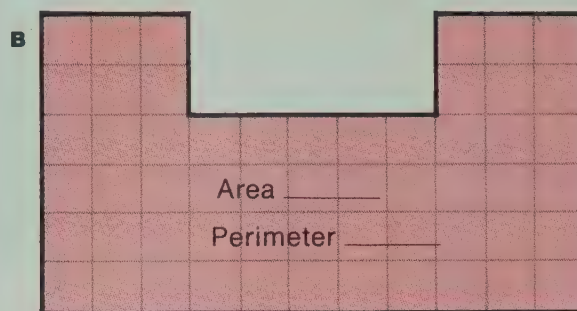
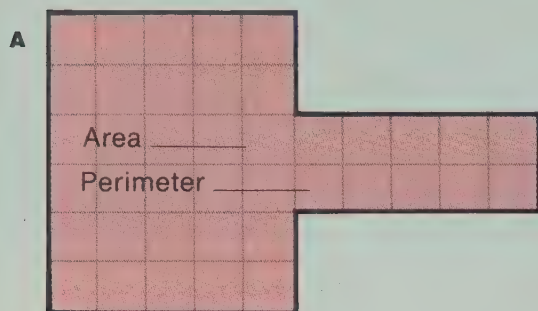
\times	\times	\times	\times	\times
<u>245</u>	<u>630</u>	<u>888</u>	<u>581</u>	<u>3720</u>
700	6300	14,800	1660	18,600
<u>945</u>	<u>6930</u>	<u>15,688</u>	<u>2241</u>	<u>22,320</u>

\times	\times	\times	\times	\times	\times
<u>1985</u>	<u>1844</u>	<u>792</u>	<u>3032</u>	<u>249</u>	<u>350</u>
11,910	9220	3960	15,160	4150	2100
<u>13,895</u>	<u>11,064</u>	<u>4752</u>	<u>18,192</u>	<u>4399</u>	<u>2450</u>

\times	\times	\times	\times	\times	\times
<u>2305</u>	<u>2368</u>	<u>461</u>	<u>3790</u>	<u>3255</u>	<u>2382</u>
27,660	14,800	27,660	45,480	41,850	35,730
<u>184,400</u>	<u>207,200</u>	<u>184,400</u>	<u>303,200</u>	<u>139,500</u>	<u>79,400</u>
<u>214,365</u>	<u>224,368</u>	<u>212,521</u>	<u>352,470</u>	<u>184,605</u>	<u>117,512</u>

● Computing – Area and Perimeter

1. Give the area and perimeter of each figure.



2. Draw figures with the given area and perimeter.

A

Area 63
Perimeter 32

B

Area 48
Perimeter 38

C

Area 154
Perimeter 50

D

Area 118
Perimeter 50

1-Digit Divisors

First write your estimate of the quotient in the colored box. Then find the quotient. Next find the difference between the two numbers. Rate yourself as directed below.

1. $4 \overline{)1496}$

Estimate

Difference

Score

2. $6 \overline{)1716}$

Estimate

Difference

Score

3. $9 \overline{)4149}$

Estimate

Difference

Score

4. $7 \overline{)3689}$

Estimate

Difference

Score

5. $8 \overline{)6896}$

Estimate

Difference

Score

6. $5 \overline{)3770}$

Estimate

Difference

Score

7. $7 \overline{)2765}$

Estimate

Difference

Score

8. $9 \overline{)5472}$

Estimate

Difference

Score

9. $8 \overline{)7296}$

Estimate

Difference

Score

Score each difference as follows:

10 or less—5 points

Between 10 and 50—3 points

50 to 100—1 point

Over 100—0 points

Add your scores and rate yourself.

35–45 Fantastic

25–34 Excellent

15–24 Good

0–14 Keep trying

● Finding Averages

The little league Giants played ten games last summer. Here are the scores for the games. The scores are not listed in the order the games were played.



Giants 12	W	Cubs 6
Giants 1	L	Dodgers 7
Giants 3	W	Yankees 2
Giants 7	W	White Sox 6
Giants 14	W	Cardinals 10
Giants 6	W	Tigers 2
Giants 4	L	Reds 7
Giants 8	L	Red Sox 9
Giants 10	W	Braves 9
Giants 5	W	Athletics 2

1. The Giants lost their first two games to the Dodgers and the Red Sox. Then they won their next game. For all three games they averaged 5 runs per game. Who did they play?
2. The Giants scored enough runs in the fourth game to keep their average at 5 runs per game. What team did they play?
3. In the fifth game they increased their average to 6 runs per game. What team did they play?
4. What was their average number of runs for the last five games of the season?
5. Against what 3 teams did they average 12 runs per game?
6. Against what 4 teams did they average only about 3 runs per game?
7. How many runs per game did the Giants average for the season? (10 games)
8. How many runs per game did their opponents average for the season?

● "Short Division"

1. Can you find the missing divisors?

A
$$\begin{array}{r} 4\ 6\ 4\ R6 \\ 3\ 2\ 5\ 4 \end{array}$$

B
$$\begin{array}{r} 4\ 5\ 2\ R2 \\ 2\ 7\ 1\ 4 \end{array}$$

C
$$\begin{array}{r} 7\ 4\ 5\ R1 \\ 3\ 7\ 2\ 6 \end{array}$$

D
$$\begin{array}{r} 6\ 7\ 0\ R2 \\ 6\ 0\ 3\ 2 \end{array}$$

E
$$\begin{array}{r} 5\ 3\ 5\ R7 \\ 4\ 2\ 8\ 7 \end{array}$$

F
$$\begin{array}{r} 6\ 6\ 3\ R0 \\ 2\ 6\ 5\ 2 \end{array}$$

G
$$\begin{array}{r} 9\ 0\ 5\ R2 \\ 2\ 7\ 1\ 7 \end{array}$$

H
$$\begin{array}{r} 5\ 4\ 9\ R3 \\ 3\ 8\ 4\ 6 \end{array}$$

I
$$\begin{array}{r} 8\ 5\ 4\ R3 \\ 5\ 1\ 2\ 7 \end{array}$$

2. Can you find the missing dividend?

A
$$\begin{array}{r} 2\ 4\ 6\ R2 \\ 7 \overline{) } \end{array}$$

B
$$\begin{array}{r} 1\ 3\ 7\ R3 \\ 5 \overline{) } \end{array}$$

C
$$\begin{array}{r} 4\ 2\ 8\ R7 \\ 9 \overline{) } \end{array}$$

D
$$\begin{array}{r} 2\ 5\ 6\ R1 \\ 7 \overline{) } \end{array}$$

E
$$\begin{array}{r} 6\ 0\ 7\ R2 \\ 4 \overline{) } \end{array}$$

F
$$\begin{array}{r} 4\ 8\ 2\ R0 \\ 6 \overline{) } \end{array}$$

G
$$\begin{array}{r} 6\ 5\ 4\ R5 \\ 7 \overline{) } \end{array}$$

H
$$\begin{array}{r} 2\ 8\ 9\ R7 \\ 8 \overline{) } \end{array}$$

I
$$\begin{array}{r} 4\ 0\ 6\ R3 \\ 5 \overline{) } \end{array}$$

3. Give missing numbers so the statement is true.

A The average of this set of numbers is 23.

18, 27, 20, _____, 12, 32

B The average of this set of numbers is 52.

39, 64, 56, 48, _____, 36, 50

C The average of this set of numbers is 238.

272, _____, 157, _____

D The average of this set of numbers is 417.

_____, _____, _____, _____, _____

● Estimating 1-Digit Quotients

Your ability to find 1-digit quotients quickly and accurately is the most important skill in finding larger quotients. First estimate each 1-digit quotient in the page **quickly**, then find the quotient.

1. $28 \overline{)168}$

Estimate

2. $53 \overline{)477}$

Estimate

3. $41 \overline{)164}$

Estimate

4. $59 \overline{)413}$

Estimate

5. $37 \overline{)222}$

Estimate

6. $62 \overline{)434}$

Estimate

7. $79 \overline{)711}$

Estimate

8. $24 \overline{)192}$

Estimate

9. $56 \overline{)168}$

Estimate

10. $49 \overline{)294}$

Estimate

11. $96 \overline{)480}$

Estimate

12. $35 \overline{)280}$

Estimate

13. $64 \overline{)256}$

Estimate

14. $77 \overline{)385}$

Estimate

15. $45 \overline{)360}$

Estimate

Rate yourself: 14 or 15 right—outstanding
12 or 13 right—excellent
10 or 11 right—good
8 or 9 right—fair
7 or less right—need more practice

Suppose you travel very close to the average speeds given below in kilometers per hour (km/h).

Walking



4 km/h

Bicycling



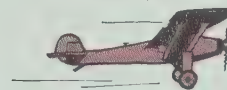
15 km/h

Car



88 km/h

Small plane



220 km/h

Jet plane



900 km/h

Use estimation to decide how you would be traveling under the given conditions.

1. New York to Chicago

Distance: 1344 km

Time: 6 hours

Traveled how? _____

2. Miami to Key West

Distance: 251 km

Time: 17 hours

Traveled how? _____

3. Kansas City to St. Louis

Distance: 403 km

Time: $4\frac{1}{2}$ hours

Traveled how? _____

4. Boston to Toronto

Distance: 720 km

Time: Almost an hour

Traveled how? _____

5. Washington to Baltimore

Distance: 61 km

Time: 15 hours

Traveled how? _____

6. Detroit to Chicago

Distance: 435 km

Time: 2 hours

Traveled how? _____

7. Chicago to Milwaukee

Distance: 145 km

Time: 10 hours

Traveled how? _____

8. Minneapolis to St. Paul

Distance: 14 km

Time: $3\frac{1}{2}$ hours

Traveled how? _____

9. San Francisco to Dallas

Distance: 2820 km

Time: 3 hours 15 min.

Traveled how? _____

10. Indianapolis to Columbus, Ohio

Distance: 276 km

Time: 3 hours 15 min.

Traveled how? _____

● Number Line Jumps

First make an estimate. Then check your estimate by computing.

1.



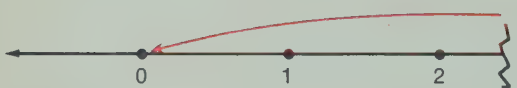
How many jumps?

Estimate

Actual

- A If each jump is 37?
- B If each jump is 42?
- C If each jump is 74?
- D If each jump is 21?

2.



How many jumps?

Estimate

Actual

- A If each jump is 91?
- B If each jump is 39?
- C If each jump is 77?
- D If each jump is 21?

3.



How long is each jump?

Estimate

Actual

- A If 65 jumps are taken?
- B If 95 jumps are taken?
- C If 57 jumps are taken?
- D If 39 jumps are taken?

● Making Division Problems

Make your own division problems according to directions. Complete the dividing to check your problem.

1. 1-digit divisor
1-digit quotient
Remainder 0

$$\begin{array}{r} \\ \overline{) } \\ \hline \end{array}$$

2. 2-digit divisor
1-digit quotient
Remainder 10

$$\begin{array}{r} \\ \overline{) } \\ \hline \end{array}$$

3. 1-digit divisor
2-digit quotient
Remainder 5

$$\begin{array}{r} \\ \overline{) } \\ \hline \end{array}$$

4. 2-digit divisor
1-digit quotient
Remainder 12

$$\begin{array}{r} \\ \overline{) } \\ \hline \end{array}$$

5. 1-digit divisor
1-digit quotient
Remainder 7

$$\begin{array}{r} \\ \overline{) } \\ \hline \end{array}$$

6. 2-digit divisor
2-digit quotient
Remainder 0

$$\begin{array}{r} \\ \overline{) } \\ \hline \end{array}$$

7. 2-digit divisor
2-digit quotient
Remainder 23

$$\begin{array}{r} \\ \overline{) } \\ \hline \end{array}$$

8. Multiple of ten divisor
2-digit quotient
Remainder 6

$$\begin{array}{r} \\ \overline{) } \\ \hline \end{array}$$

● Making Special Division Problems

You have just two rules to follow when you make these problems.

Rule 1 The divisor and the quotient are the same.

Rule 2 The remainder is zero.

1.
$$\begin{array}{r} \\ 3 \overline{) 6} \end{array} \text{ R0}$$

2.
$$\begin{array}{r} \\ 6 \overline{) 4} \end{array} \text{ R0}$$

3.
$$\begin{array}{r} \\ 1 \overline{) 000} \end{array} \text{ R0}$$

4.
$$\begin{array}{r} \\ 1 \overline{) 44} \end{array} \text{ R0}$$

5.
$$\begin{array}{r} \\ 2 \overline{) 25} \end{array} \text{ R0}$$

6.
$$\begin{array}{r} \\ 3 \overline{) 61} \end{array} \text{ R0}$$

7.
$$\begin{array}{r} \\ 6 \overline{) 25} \end{array} \text{ R0}$$

8.
$$\begin{array}{r} \\ 8 \overline{) 41} \end{array} \text{ R0}$$

9.
$$\begin{array}{r} \\ 1 \overline{) 444} \end{array} \text{ R0}$$

10.
$$\begin{array}{r} \\ 2 \overline{) 809} \end{array} \text{ R0}$$

● Finding the Missing Digits

Find the missing digits.

$$\begin{array}{r} 7 \\ 24 \overline{) } \\ 42 \\ \underline{} \\ 3 \end{array}$$

$$\begin{array}{r} 2. \quad \quad 8 \\ \overline{) } \\ 3 2 \\ \underline{ 3 7} \\ 1 \end{array}$$

3.
$$\begin{array}{r} 4 \\ 7 \overline{) 170} \\ \underline{30} \\ 6 \end{array}$$

$$\begin{array}{r} 4 \overline{) 126} \\ \underline{126} \\ 0 \end{array}$$

$$\begin{array}{r} 5 \overline{) 534} \\ \underline{4} \\ 1 \\ \underline{0} \end{array}$$

6.
$$\begin{array}{r} 7 \\ 84 \overline{) 615} \\ \underline{000} \\ 252 \end{array}$$

7.
$$\begin{array}{r} 3 \\ \hline 7 \overline{) 6} \\ \hline 1 \ 8 \ 7 \\ \hline 1 \ 3 \ 6 \\ \hline 2 \ 0 \end{array}$$

8.

$$\begin{array}{r} 75 \overline{) } \\ \underline{225} \\ 600 \\ \underline{150} \end{array}$$

9.
$$\begin{array}{r} 54 \\ 345 \\ \hline 331 \\ \hline \end{array}$$

● Solving Problems

Suppose everyone in your class brought cookies for a bake sale. Give some numbers that make sense for the blanks below. Then write some problems about the sale. For each problem use one or more operations including the one suggested in the box.

Total number of cookies to sell. _____

Number in your class. _____

Number of cookies in a box. _____

Price per box. _____


Number of cookies in a sack. _____

Price per sack. _____

Number in a dozen. _____


Price per dozen. _____



1. 

2. 

3. 

4. 

Study the example and complete the table. List all of the factors of the numbers shown in black except the number itself. Notice that when the sum of these factors is less than the given number it is called a **deficient** number. When the sum of these factors is equal to the number it is called **perfect**. And when the sum of these factors is greater than the number it is called an **abundant** number.

Number	Factors of the number (not including the number)	Sum of the factors of the number	Type of number
4	1, 2	3	deficient
6	1, 2, 3	6	perfect
8			
9			
10			
12			
14			
15			
16			
18	1, 2, 3, 6, 9	21	abundant
20			
21			
22			
24			
26			
28			

1 Sorting Out the Primes

Follow these directions for the numbers in the red box.

- A** Mark out 1. It is not prime.
- B** 2 is prime. Each other multiple of 2 is not prime. Mark out each one.
- C** 3 is prime. Each other multiple of 3 is not prime. Mark out each one.
- D** 5 is prime. Each other multiple of 5 is not prime. Mark out each one.
- E** 7 is prime. Each other multiple of 7 is not prime. Mark out each one.

The numbers not marked out are the prime numbers

less than 120. How many are there? _____

2 Searching for Patterns

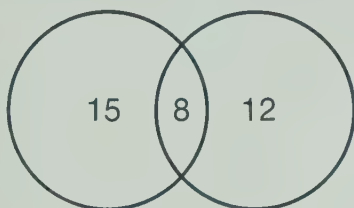
- A** Do the multiples of 2 all lie in certain columns? Which columns? _____
- B** Do the multiples of 3 all lie in certain columns? Which columns? _____
- C** Do the multiples of 5 all lie according to some pattern? Draw a red line through these multiples to show the pattern.
- D** Do the multiples of 7 all lie according to some pattern? Draw a blue line through these multiples to show the pattern.
- E** Do all the prime numbers lie in certain columns? Which columns? _____

Columns					
↓	↓	↓	↓	↓	↓
1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36
37	38	39	40	41	42
43	44	45	46	47	48
49	50	51	52	53	54
55	56	57	58	59	60
61	62	63	64	65	66
67	68	69	70	71	72
73	74	75	76	77	78
79	80	81	82	83	84
85	86	87	88	89	90
91	92	93	94	95	96
97	98	99	100	101	102
103	104	105	106	107	108
109	110	111	112	113	114
115	116	117	118	119	120

● Diagram Decisions

Each diagram below deals with sets that intersect. Yet each diagram is different in some way. Can you answer the questions? The numbers tell how many students are in each region of the diagram.

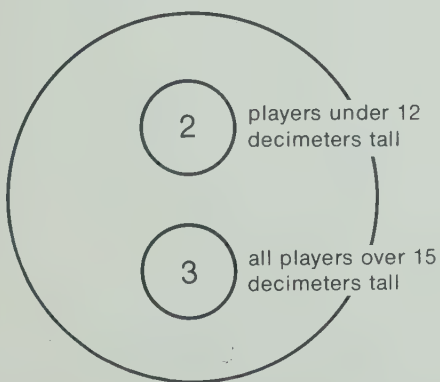
1. Students with blue eyes Students with brown hair



How many students

- A have blue eyes? 23
 B have brown hair? _____
 C have blue eyes and brown hair? _____
 D altogether? _____

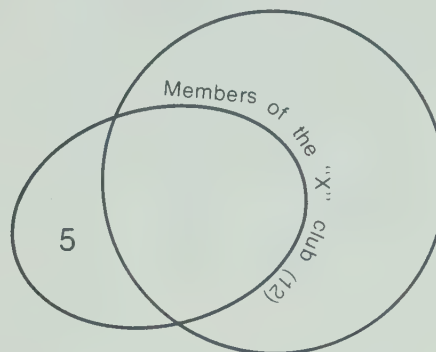
2. All players on the basketball squad (17)



How many players are

- A from 12 decimeters to 15 decimeters tall? _____
 B 12 decimeters tall or over? _____
 C 15 decimeters tall or under? _____

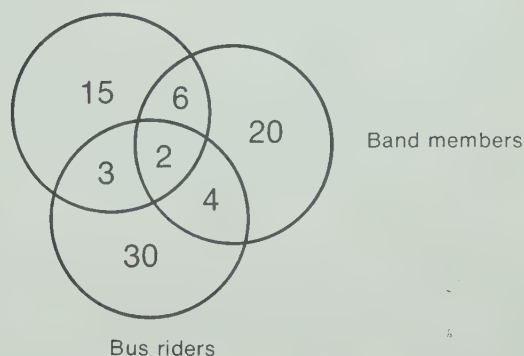
3. Members of Mr. Jenk's class (35)



How many students in

- A the "X" club are in Mr. Jenk's class? _____
 B Mr. Jenk's class are not in the "X" club? _____

4. Mr. Jones' class



How many students

- A in Mr. Jones' class? _____
 B play in the band and ride the bus? _____
 C in Mr. Jones' class ride the bus and play in the band? _____
 D altogether? _____

● Let's Play a Factor Game

Play this "factor game" with a classmate. Use this **Number Chart**, the **scoring table**, and the **procedure** below.

2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17
18	19	20	21	22	23	24	25
26	27	28	29	30	31	32	33
34	35	36	37	38	39	40	41

Number Chart

Player A	Player B

Scoring Table

Procedure:

1. Player A picks a number from the chart, crosses it out and records it in the scoring table.
2. Player B crosses out each factor of A's number (not already crossed out) and records the sum of those factors in his column of the scoring table.
3. Player A picks another number, crosses it out in the chart, and records it in the table.
4. Since A's number has no factors in the table, it is now B's turn to choose a number, cross it out in the chart, and record it in his column.
5. The game proceeds as before with A crossing out all the factors of B's number (not already crossed out) and recording the sum of those numbers he crossed out in his column.
6. The player with the largest total score when all numbers are crossed out wins the game.

EXAMPLE

Player A	Player B
21	10 (3 + 7)
41	35
5	

● Multiple Patterns

Color each array according to the directions. Search for color patterns and then answer the questions.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Color all multiples of 3

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Color all multiples of 4

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Color all multiples of 5

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Color all multiples of 7

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Color all multiples of 12

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Color all multiples of 18

- Which sets of multiples give column patterns? _____
- Which sets of multiples give diagonal patterns hitting all columns? _____
- Which sets of multiples give diagonal patterns hitting only certain columns? _____
- Use tracing paper to trace and fill in the coloring for multiples of 12. Place your tracing over the coloring for multiples of 18. How can you describe
 - the numbers that are colored twice? _____
 - the smallest of these numbers? _____

Try these activities and answer the questions.

1. Use a meter stick.

- A Cut a piece of string 1 meter long. (Call it piece A.)
- B Cut a piece of string $\frac{1}{10}$ meter long. (Call it piece B.)
- C Can you cut a piece of string $\frac{1}{100}$ meter long? (Call this length of string piece C.)
- D Can you cut a piece of string $\frac{1}{1000}$ meter long? (Call this length of string piece D.)

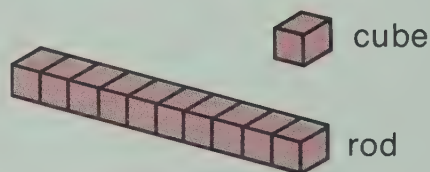


2. Use the string you cut in part 1. Write a fraction in each blank.

- A Piece B is _____ piece A.
- B Piece C is _____ piece B.
- C Piece D is _____ piece C.
- D Piece C is _____ piece A.
- E Piece D is _____ piece A.
- F Piece D is _____ piece B.

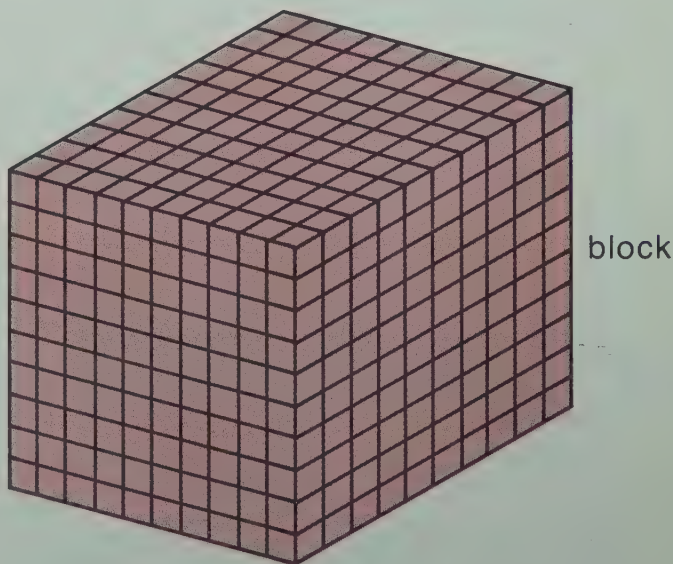
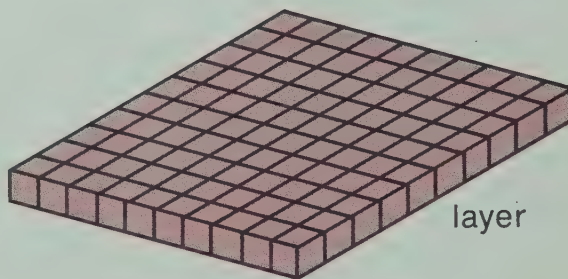
3. Use or think about 1 centimeter cubes.

- A It takes _____ of them to make a rod.
- B It takes _____ of them to make a layer.
- C It takes _____ of them to make a block.



4. Think about the figures in part 3.
Write a fraction in each blank.

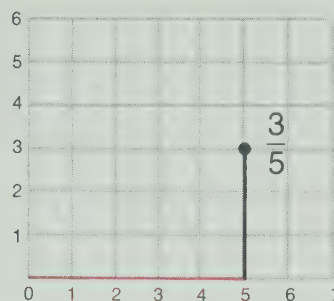
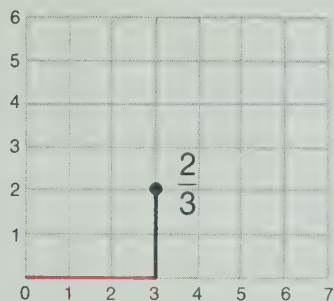
- A A cube is _____ of a rod.
- B A rod is _____ of a layer.
- C A layer is _____ of a block.
- D A cube is _____ of a layer.
- E A rod is _____ of a block.
- F A cube is _____ of a block.



● Graphing Fractions

Study the examples. Then answer the questions.

EXAMPLES:



The dot is the graph of $\frac{2}{3}$

This dot is the graph of $\frac{3}{5}$

1. Graph these fractions and label them using the letters.

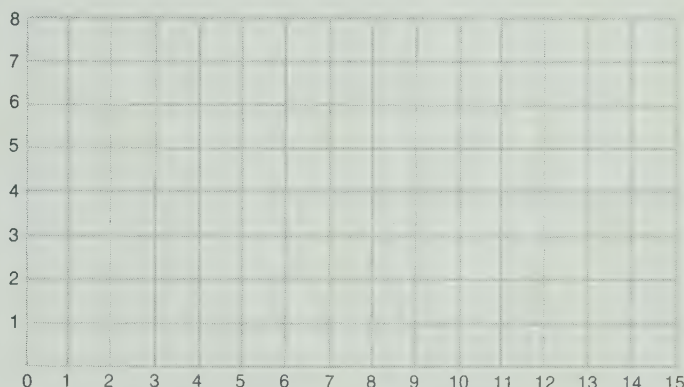
You need not draw the red and black lines used in the examples.

A $\frac{1}{2}$ **E** $\frac{1}{10}$ **I** $\frac{8}{5}$

B $\frac{5}{8}$ **F** $\frac{3}{4}$ **J** $\frac{7}{7}$

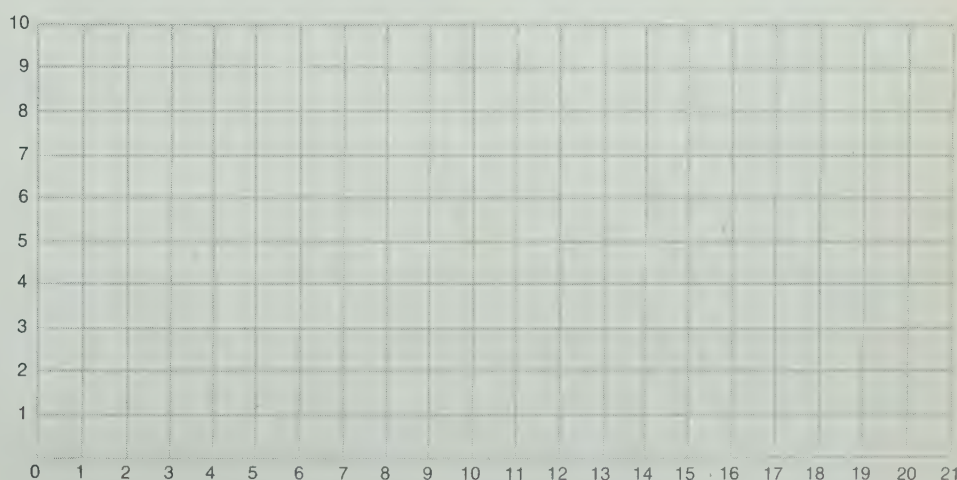
C $\frac{7}{12}$ **G** $\frac{6}{12}$ **K** $\frac{6}{8}$

D $\frac{4}{5}$ **H** $\frac{1}{3}$ **L** $\frac{8}{15}$



2. Graph the first 7 fractions in this set of equivalent fractions.

$$\left\{ \frac{1}{3}, \frac{2}{6}, \frac{3}{9}, \frac{4}{12}, \dots \right\}$$



A What did you discover about the dots? _____

B Graph other sets of equivalent fractions on your graph paper.

Is your discovery still true? _____

● Multiple Strips and Equivalent Fractions

These strips are called **Multiple Strips** because each strip contains multiples of the first number on the strip.

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

4	8	12	16	20	24	28	32	36	40
---	---	----	----	----	----	----	----	----	----

2	4	6	8	10	12	14	16	18	20
---	---	---	---	----	----	----	----	----	----

5	10	15	20	25	30	35	40	45	50
---	----	----	----	----	----	----	----	----	----

3	6	9	12	15	18	21	24	27	30
---	---	---	----	----	----	----	----	----	----

10	20	30	40	50	60	70	80	90	100
----	----	----	----	----	----	----	----	----	-----

1. Complete these two multiple strips for any numbers you choose.

A

--	--	--	--	--	--	--	--	--	--

B

--	--	--	--	--	--	--	--	--	--

2. When two multiple strips are placed together, are equivalent fractions

formed? _____

Complete these multiple strips to check this.

2	4								
3	6								

3. Make a set of equivalent fractions for each pair of blank strips below. Use only the multiple strips shown above. Choose only those in which the greatest common factor (GCF) of the numerator and denominator of the first fraction is 1.

A

B

C

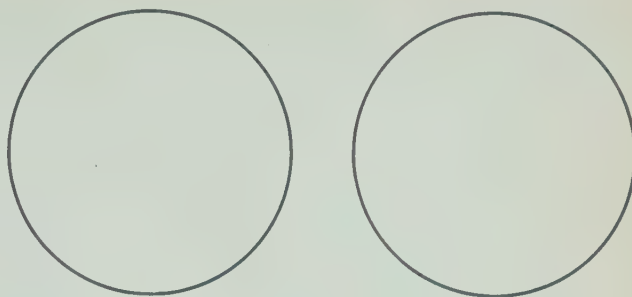
D

E

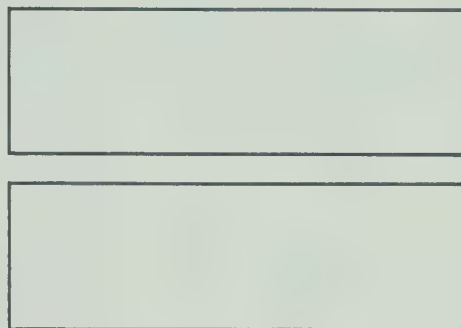
F

● Correcting Fraction Errors

1. Sara asked Eric if he wanted $\frac{1}{3}$ or $\frac{1}{4}$ of a pizza pie. Eric said "I'll take $\frac{1}{4}$! Everyone knows that $\frac{1}{4}$ is more than $\frac{1}{3}$." Draw pictures to show Eric his mistake.



2. Sue insisted that $\frac{1}{2}$ and $\frac{3}{6}$ could not be equivalent fractions because they have different numbers. Draw pictures to convince Sue that $\frac{1}{2}$ is equivalent to $\frac{3}{6}$.



3. Janelle tried to form a set of equivalent fractions. She wrote:

$$\left\{ \frac{2}{3}, \frac{3}{4}, \frac{6}{9}, \frac{8}{12}, \frac{10}{15} \right\}$$

- A Can you find the "wrong fraction" in the set?
- B Make your own set of "equivalent fractions" and put a "wrong fraction" in the set. See if a classmate can find the "wrong fraction."

4. Fred said that he had discovered an easy way to reduce certain types of fractions that "always works." He wrote:

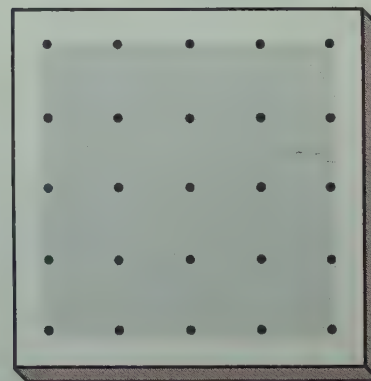
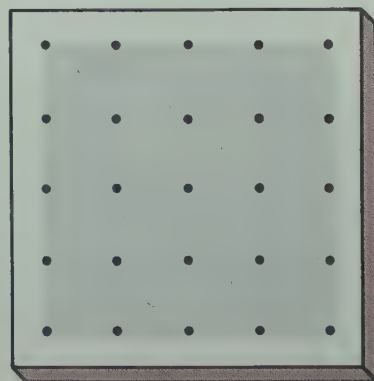
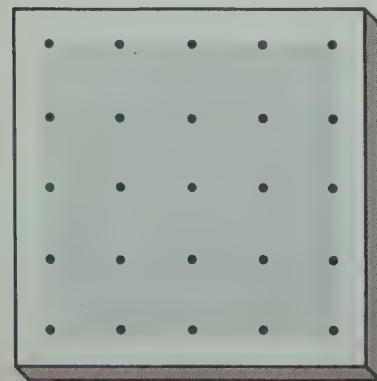
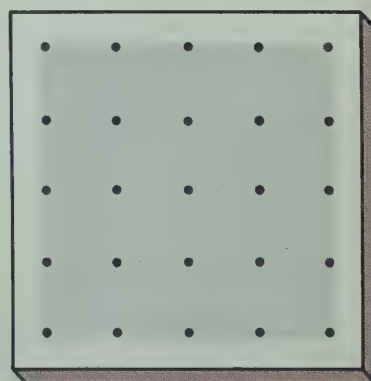
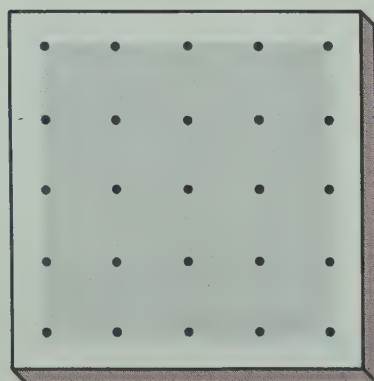
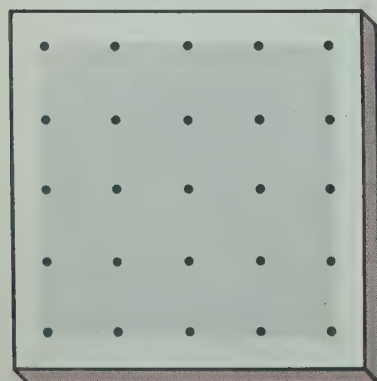
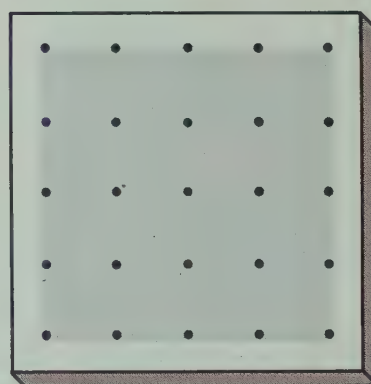
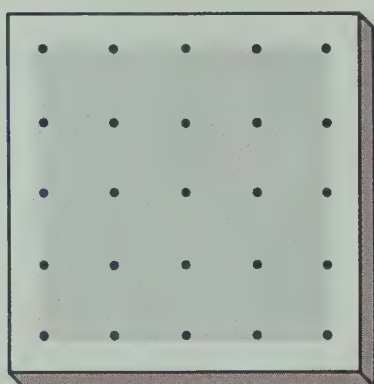
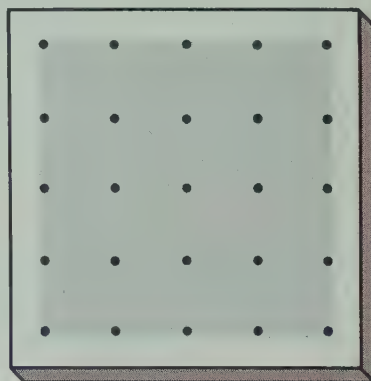
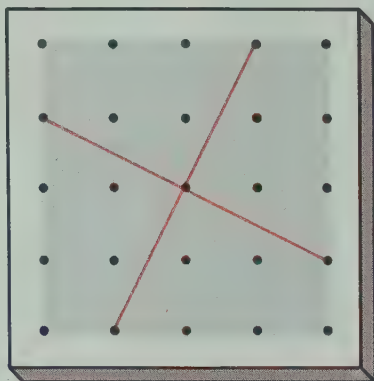
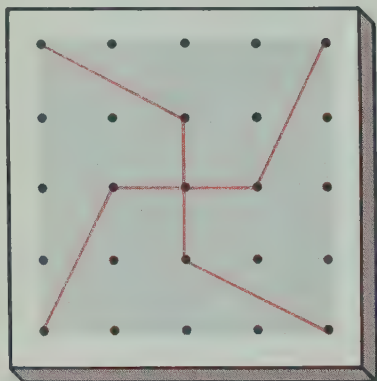
$$\frac{\cancel{16}}{\cancel{64}} = \frac{1}{4} \quad \frac{\cancel{19}}{\cancel{95}} = \frac{1}{5}$$

(Check these. Do they work?)

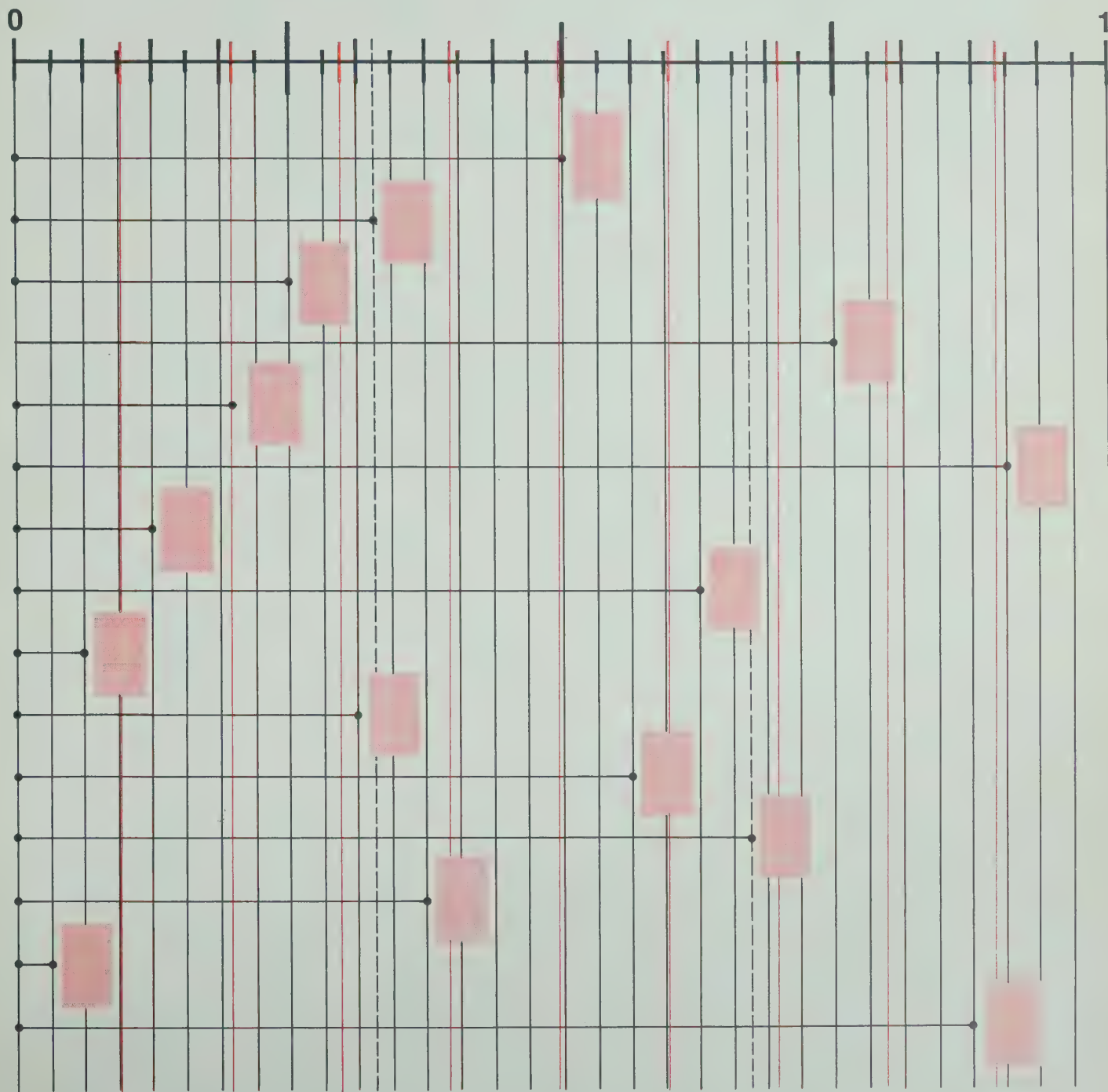
Give some fractions of this type that "don't work" to show Fred his method seldom works.

● Fractions on the Geoboard

The first two pictures show ways to “divide a geoboard” in fourths in such a way that each of the 4 parts is the same size and shape. Show as many other different ways as you can to do this.



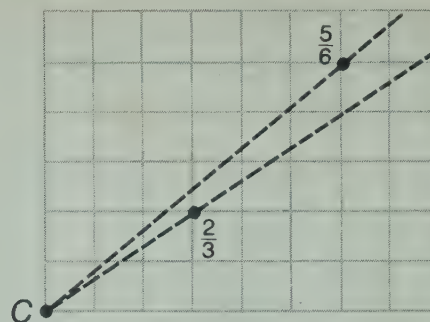
Use the markings on the heavy “guide line” to help you write a fractional number which gives the length of each segment below. Label the “guide line” for easy reference.



● Another Way to Compare Fractional Numbers

1. Study this example:

- A Graph $\frac{2}{3}$ (See page 55 for a reminder on how to graph a fraction)
- B Graph $\frac{5}{6}$
- C Draw lines from the corner point C through these dots.
- D Which line shows the "steepest hill?"
- E Write $>$ or $<$ to indicate that the fraction with the "steepest hill" shows the larger number.



$$\frac{2}{3} < \frac{5}{6}$$

2. Draw the graphs and lines. Then write $<$ or $>$ in each 



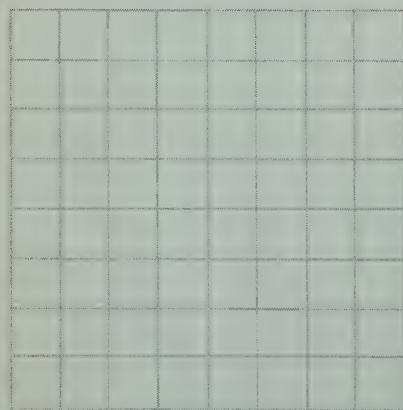
$$\frac{3}{7} \text{  } \frac{5}{8}$$



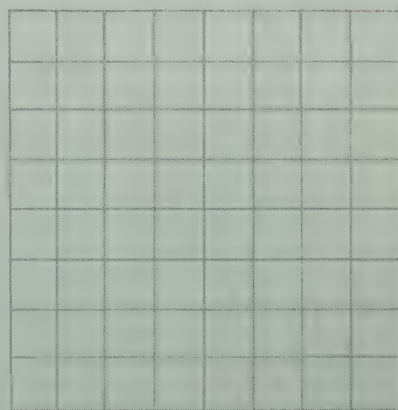
$$\frac{3}{4} \text{  } \frac{3}{5}$$



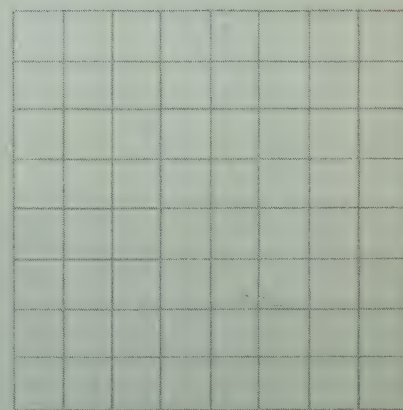
$$\frac{1}{5} \text{  } \frac{2}{7}$$



$$\frac{4}{5} \text{  } \frac{3}{8}$$



$$\frac{4}{7} \text{  } \frac{7}{8}$$



$$\frac{2}{5} \text{  } \frac{1}{4}$$

Between You and Me

Find a fractional number that is between each of the two numbers given on the number line. Write it in the

(Hint: Rewrite the two given fractions using equivalent fractions with the same denominators.)

1.



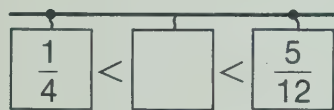
2.



3.



4.



5.



6.



7.



8.



9.



10.



11.



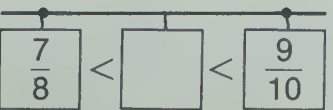
12.



13.



14.

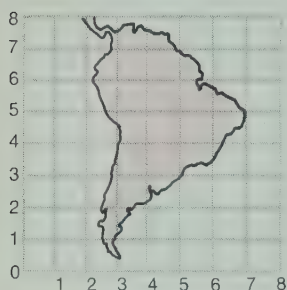


15.



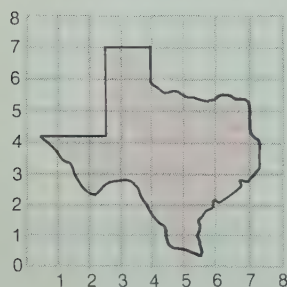
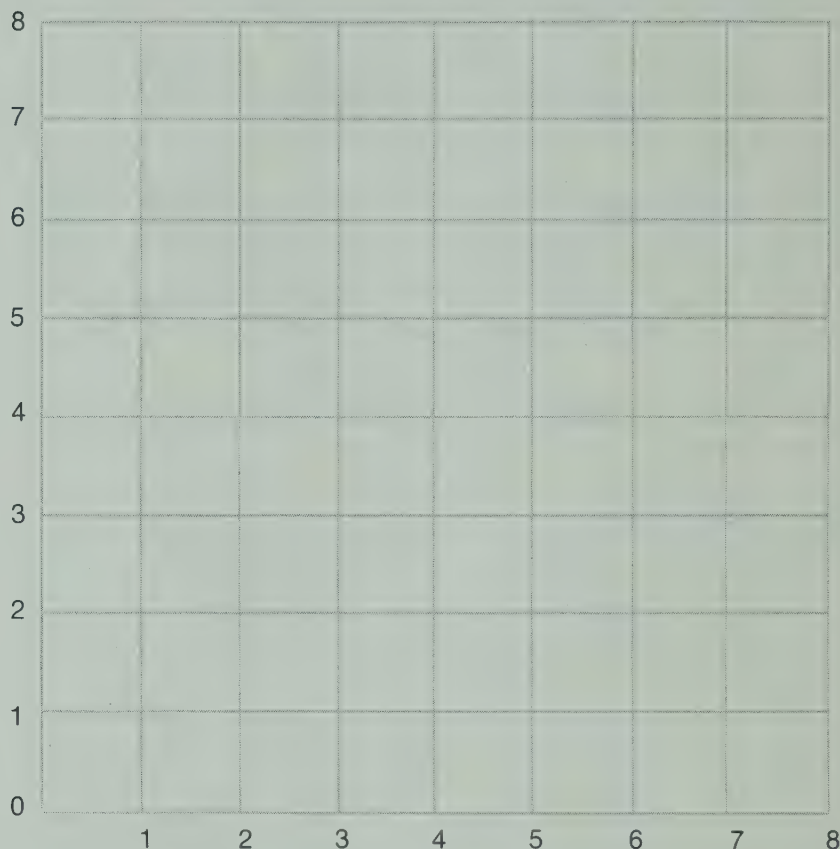
Using Ratios to Enlarge Pictures

Make an enlargement of the small grid picture on the large grid. The numbers along the sides of the grid should help you locate matching points. Then give the **ratio** of distance on the large grid to the matching distance on the small grid.



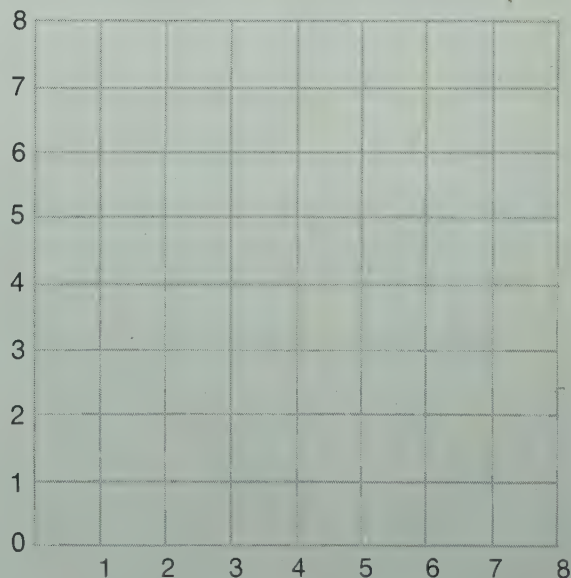
Small grid — unit
 Large grid — unit
 Ratio of large grid distance to small grid distance:

_____ to _____



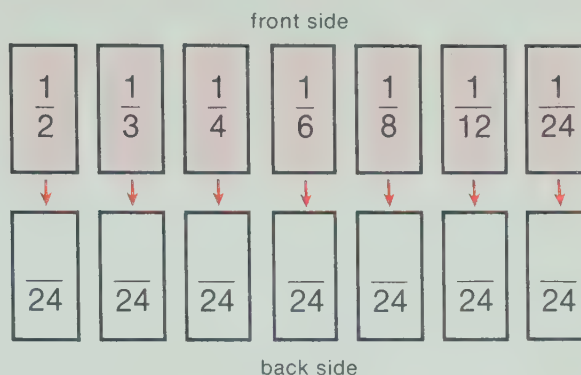
Small grid — unit
 Large grid — unit
 Ratio of large grid distance to small grid distance:

_____ to _____



Make or imagine a set of cards that have these **unit fractions** on the front.

Complete the cards so they have fractions on the back with denominator 24 which are equivalent to the fractions on the front.



Use the cards to help you look for ways to complete the equations below. For each exercise write a different **unit fraction** on the cards.

1. $\frac{1}{8} + \frac{1}{12} + \frac{1}{24} = \frac{1}{4}$

7. $\frac{1}{2} - \frac{\quad}{\quad} - \frac{\quad}{\quad} = 0$

2. $\frac{\quad}{\quad} + \frac{\quad}{\quad} + \frac{\quad}{\quad} = \frac{1}{3}$

8. $\frac{1}{3} - \frac{\quad}{\quad} - \frac{\quad}{\quad} = 0$

3. $\frac{\quad}{\quad} + \frac{\quad}{\quad} + \frac{\quad}{\quad} = \frac{1}{2}$

9. $\frac{1}{4} - \frac{\quad}{\quad} - \frac{\quad}{\quad} = 0$

4. $\frac{\quad}{\quad} + \frac{\quad}{\quad} + \frac{\quad}{\quad} = \frac{3}{4}$

10. $\frac{1}{6} - \frac{\quad}{\quad} - \frac{\quad}{\quad} = 0$

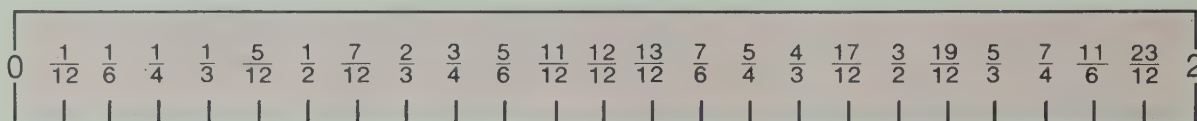
5. $\frac{\quad}{\quad} + \frac{\quad}{\quad} + \frac{\quad}{\quad} = 1$

11. $\frac{\quad}{\quad} + \frac{\quad}{\quad} + \frac{\quad}{\quad} = \frac{2}{3}$

6. $\frac{\quad}{\quad} + \frac{\quad}{\quad} + \frac{\quad}{\quad} + \frac{\quad}{\quad} + \frac{\quad}{\quad} + \frac{\quad}{\quad} = 1$

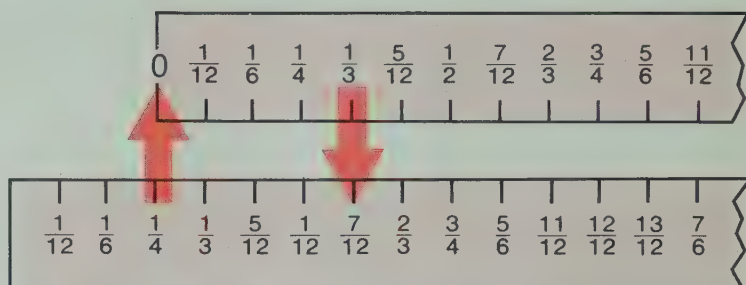
● A Fraction Slide Rule

Use tracing paper to make a copy of this "ruler." Put the division marks on the top instead of the bottom.



Use the two "rulers" as shown here to find the sum or difference of pairs of fractional numbers given below.

Choose 3 of the problems below and do them the usual way to check the slide rule answers.



$$\frac{1}{4} + \frac{1}{3} = \frac{7}{12} \quad \text{or} \quad \frac{7}{12} - \frac{1}{3} = \frac{1}{4}$$

1. $\frac{1}{4} + \frac{1}{12} =$ _____

6. $\frac{1}{6} + \frac{2}{3} =$ _____

11. $\frac{2}{3} + \frac{3}{4} =$ _____

2. $\frac{7}{12} - \frac{1}{3} =$ _____

7. $\frac{7}{12} + \frac{1}{4} =$ _____

12. $\frac{3}{4} + \frac{5}{6} =$ _____

3. $\frac{1}{6} + \frac{1}{4} =$ _____

8. $\frac{3}{4} - \frac{5}{12} =$ _____

13. $\frac{5}{3} - \frac{5}{6} =$ _____

4. $\frac{5}{12} + \frac{1}{2} =$ _____

9. $\frac{7}{12} + \frac{1}{3} =$ _____

14. $2 - \frac{7}{6} =$ _____

5. $\frac{11}{12} - \frac{1}{3} =$ _____

10. $\frac{5}{6} - \frac{5}{12} =$ _____

15. $\frac{5}{6} + \frac{13}{12} =$ _____

"Check" space

● Fraction Magic Squares

In a magic square, the sum of the numbers in each row, each column, and each main diagonal is the same. This sum is called the "magic number" of the square. Can you complete these magic squares?

1.

$\frac{2}{3}$	$\frac{1}{12}$	$\frac{1}{2}$
$\frac{1}{4}$	$\frac{5}{12}$	$\frac{7}{12}$
$\frac{1}{3}$	$\frac{3}{4}$	$\frac{1}{6}$

Magic Number _____

2.

		$\frac{3}{2}$
	2	
	0	

Magic Number 6

3.

2		
	$\frac{5}{4}$	$\frac{7}{4}$
		$\frac{1}{2}$

Magic Number _____

4.

$\frac{1}{2}$		1
$\frac{1}{4}$		$\frac{3}{4}$

Magic Number $\frac{15}{8}$

5.

$\frac{2}{5}$	$\frac{7}{5}$	
$\frac{9}{5}$	1	
		$\frac{8}{5}$

Magic Number _____

6.

$\frac{7}{12}$		
$\frac{1}{4}$		$\frac{1}{12}$

Magic Number 1

7.

$\frac{13}{4}$			
		$\frac{5}{2}$	$\frac{5}{4}$
		$\frac{3}{2}$	$\frac{9}{4}$
	$\frac{7}{2}$	$\frac{15}{4}$	1

Magic Number $\frac{17}{2}$

8.

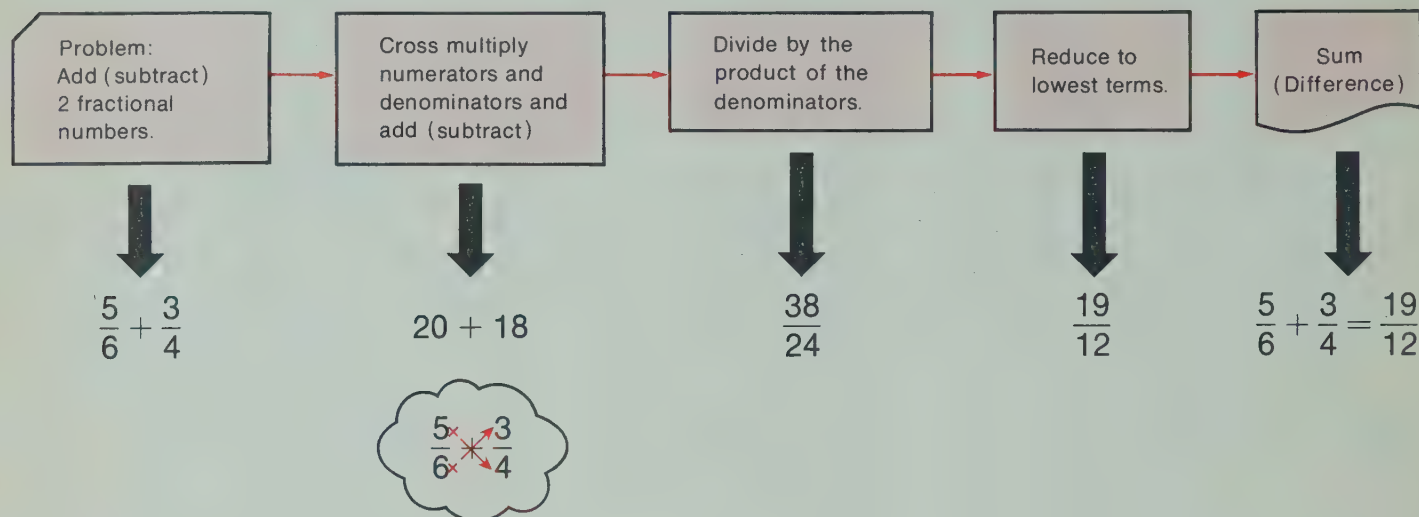
$\frac{7}{4}$			$\frac{3}{2}$
$\frac{7}{2}$	$\frac{1}{4}$	1	$\frac{15}{4}$
	$\frac{13}{4}$		$\frac{3}{4}$
		$\frac{5}{4}$	$\frac{5}{2}$

Magic Number _____

● A Fractional Number Shortcut

This flow chart shows a “shortcut” for adding or subtracting fractional numbers. Study the example and use it to find the sums and differences below.

Check two of the problems to see if the shortcut worked.



1. $\frac{2}{3} + \frac{3}{4} =$

2. $\frac{3}{8} + \frac{4}{7} =$

3. $\frac{5}{6} + \frac{7}{8} =$

4. $\frac{3}{5} + \frac{2}{3} =$

5. $\frac{5}{8} + \frac{7}{12} =$

6. $\frac{1}{6} + \frac{7}{8} =$

7. $\frac{5}{6} - \frac{3}{4} =$

8. $\frac{7}{8} - \frac{2}{7} =$

9. $\frac{2}{3} - \frac{3}{5} =$

10. $\frac{1}{2} - \frac{3}{8} =$

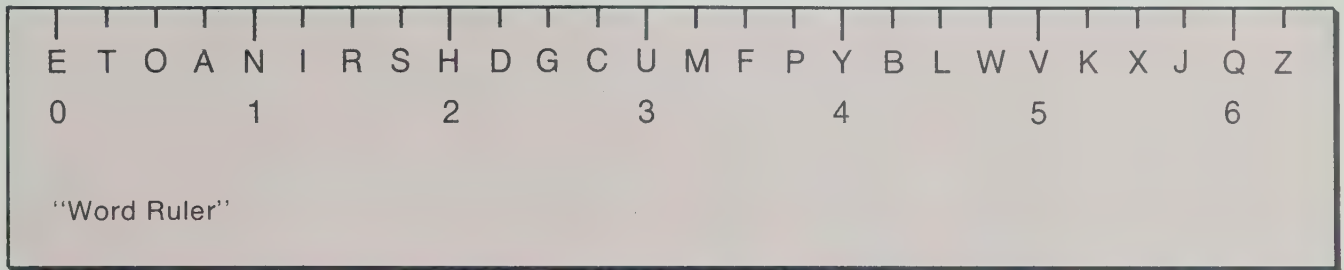
11. $\frac{3}{4} - \frac{2}{5} =$

12. $\frac{7}{8} - \frac{7}{12} =$

“Check” space

● Measure Your Words!

Here is a special ruler you can use to find the “length” of a word. Study the examples and answer the questions.



EXAMPLES: F U N
 $3\frac{1}{2} + 3 + 1 = 7\frac{1}{2}$

M A T H
 $3\frac{1}{4} + \frac{3}{4} + \frac{1}{4} + 2 = 6\frac{1}{4}$

“Fun” is a “longer word” than “Math.”

1. Can you find the “length” of your name? _____

2. Which is “longer,” your first name or your last name? _____

3. Give the length of each word.

A CUT _____ B DOT _____ C BIT _____

D ROB _____ E JET _____ F WIN _____

4. Each sum below represents a name. Find the sum and the name.

↓ ↓ ↓ ↓
 $5\frac{3}{4} + \frac{3}{4} + 2\frac{3}{4} + 5\frac{1}{4} =$ _____

↓ ↓ ↓ ↓ ↓
 $1\frac{3}{4} + \frac{3}{4} + 4\frac{1}{2} + 4\frac{1}{2} + 4 =$ _____

5. Can you find a word with length 6? _____

● Cracking the Code

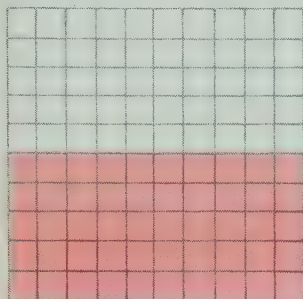
Use the Word Ruler on page 67 to decode this question. (Read down the column.)
The answer to the question is on the bottom of page 70.

	Answer	Letter		Answer	Letter
1. $2\frac{7}{8} + 1\frac{7}{8} =$	_____		16. $9\frac{1}{5} - 7\frac{19}{20} =$	_____	
2. $7\frac{1}{4} - 5\frac{3}{12} =$	_____		17. $\frac{1}{12} + \frac{1}{6} =$	_____	
3. $6\frac{7}{12} - 5\frac{5}{6} =$	_____		18. $18\frac{1}{16} - 17\frac{13}{16} =$	_____	
4. $4\frac{1}{8} - 3\frac{7}{8} =$	_____		19. $3\frac{1}{8} + 1\frac{3}{8} =$	_____	
5. $1\frac{7}{16} + \frac{13}{16} =$	_____		20. $6\frac{1}{2} - 6\frac{5}{10} =$	_____	
6. $6\frac{1}{8} - 4\frac{7}{8} =$	_____		21. $\frac{9}{10} + \frac{17}{20} =$	_____	
7. $1\frac{3}{7} + \frac{23}{28} =$	_____		22. $2\frac{1}{3} + \frac{17}{12} =$	_____	
8. $1\frac{1}{8} - \frac{7}{8} =$	_____		23. $10 - 8\frac{5}{10} =$	_____	
9. $5\frac{7}{8} - 3\frac{7}{8} =$	_____		24. $8 - 7\frac{9}{18} =$	_____	
10. $8\frac{1}{2} - 8\frac{1}{2} =$	_____		25. $1\frac{5}{8} + 1\frac{3}{8} =$	_____	
11. $8\frac{7}{12} - 3\frac{5}{6} =$	_____		26. $12\frac{1}{5} - 11\frac{19}{20} =$	_____	
12. $37\frac{1}{16} - 35\frac{13}{16} =$	_____		27. $\frac{9}{16} + \frac{19}{16} =$	_____	
13. $\frac{7}{8} + \frac{7}{8} =$	_____		28. $6\frac{5}{9} - 5\frac{29}{36} =$	_____	
14. $\frac{0}{3} - \frac{0}{5} =$	_____		29. $2\frac{1}{8} + 1\frac{21}{24} =$	_____	
15. $2\frac{5}{7} + 1\frac{11}{14} =$	_____				

?

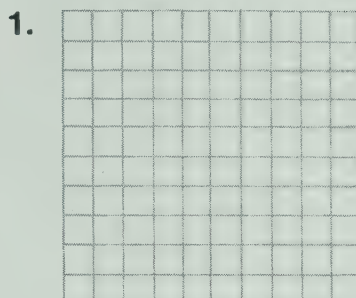
Color the part of the grid indicated. Write the missing fraction, decimal, or percent.

EXAMPLE:



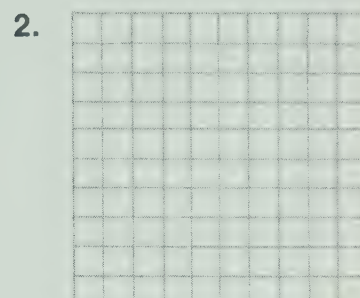
fraction $\frac{1}{2}$
 decimal .50
 percent 50 %

of the grid is shaded.



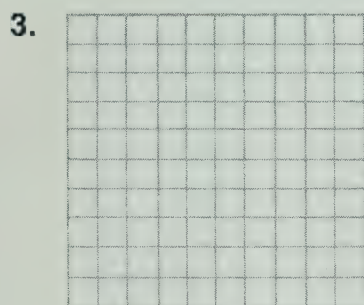
fraction $\frac{1}{4}$
 decimal _____
 percent _____ %

of the grid is shaded.

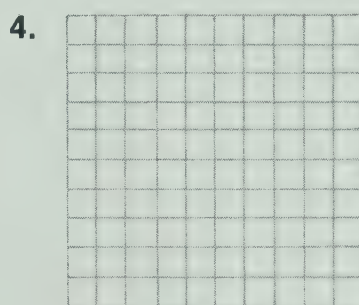


fraction _____
 decimal .75
 percent _____ %

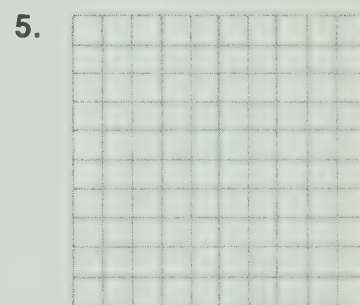
of the grid is shaded.



fraction $\frac{1}{5}$ decimal _____
 percent 20 %

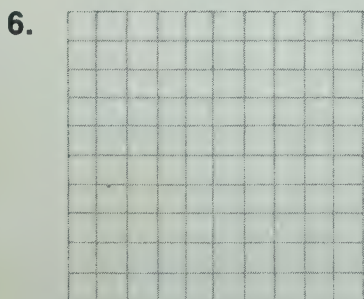


fraction $\frac{1}{100}$ decimal _____
 percent _____ %

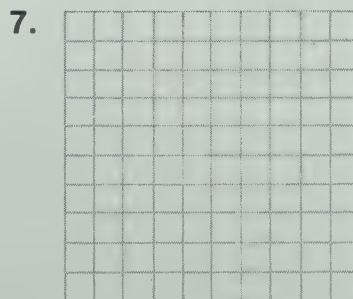


fraction _____ decimal _____
 percent 90 %

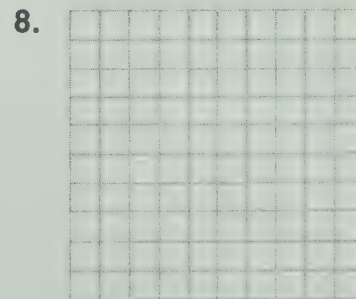
_____ choose your own _____



fraction _____ decimal .40
 percent _____ %



fraction _____ decimal _____
 percent _____ %



fraction _____ decimal _____
 percent _____ %

● A Graphical Look at Decimals and Fractions

Graph as many fractions from each set of equivalent fractions as you can and draw a line for this set on the graph. Use the decimal scale to give or estimate, the decimal for each set.

EXAMPLE: $\left\{\frac{1}{2}, \frac{2}{4}, \frac{3}{6}, \frac{4}{8}, \dots\right\}$.50

$\left\{\frac{2}{5}, \frac{4}{10}, \frac{6}{15}, \frac{8}{20}, \dots\right\}$ _____

$\left\{\frac{3}{8}, \frac{6}{16}, \frac{9}{24}, \frac{12}{32}, \dots\right\}$ _____

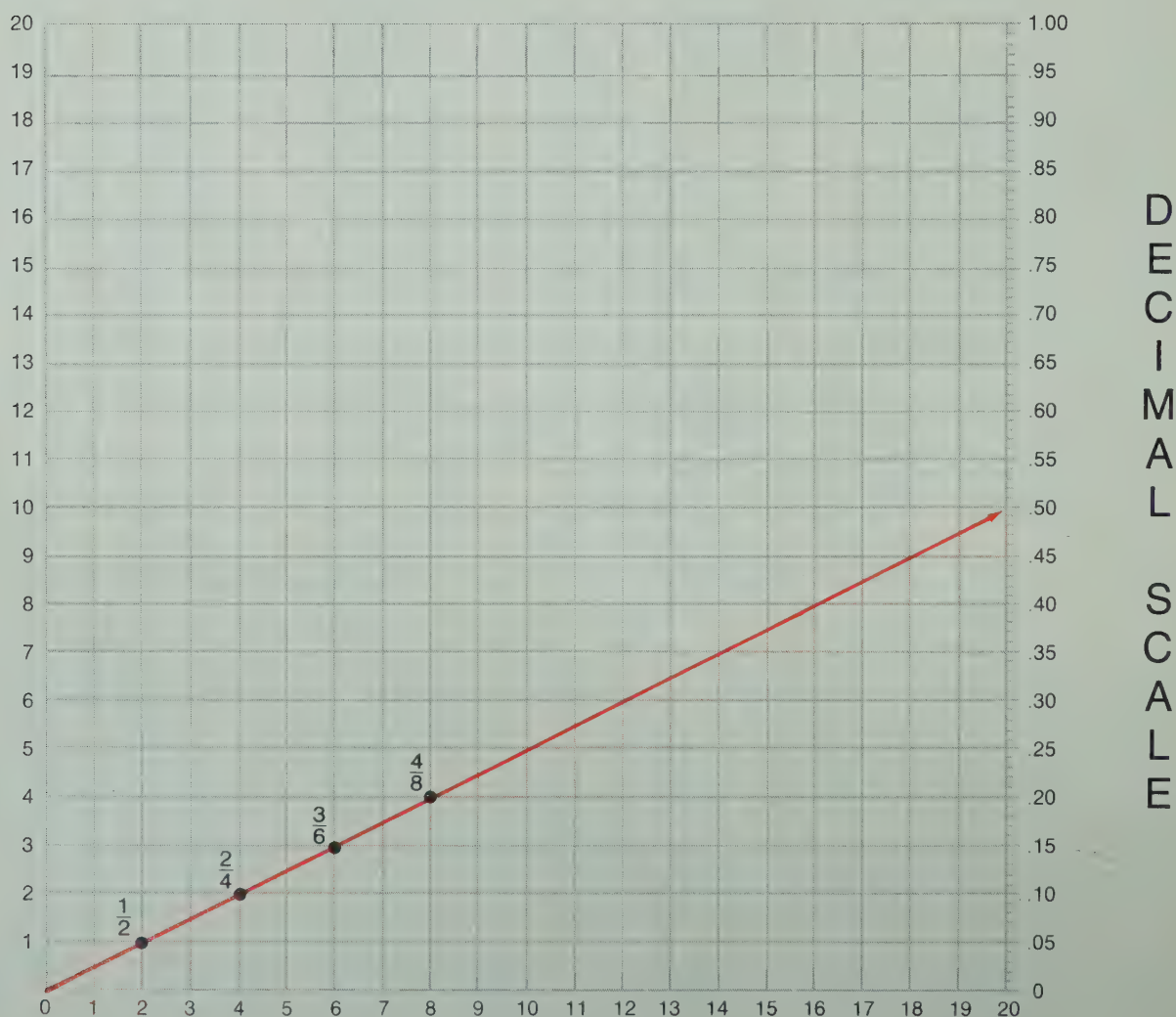
$\left\{\frac{5}{6}, \frac{10}{12}, \frac{15}{18}, \frac{20}{24}, \dots\right\}$ _____

$\left\{\frac{1}{6}, \frac{2}{12}, \frac{3}{18}, \frac{4}{24}, \dots\right\}$ _____

$\left\{\frac{1}{8}, \frac{2}{16}, \frac{3}{24}, \frac{4}{32}, \dots\right\}$ _____

$\left\{\frac{7}{8}, \frac{14}{16}, \frac{21}{24}, \frac{28}{32}, \dots\right\}$ _____

$\left\{\frac{1}{3}, \frac{2}{6}, \frac{3}{9}, \frac{4}{12}, \dots\right\}$ _____



“Geometry” say it slowly

● Writing Story Problems Using Decimals

Use the information given to write a story problem using decimals which you can solve. Show your solution.

1.

Average cost of electricity about 3.56¢ for each kilowatt hour.

Kilowatt hours used per month.
Toaster-about 3
Mixer-about 1
Sink disposal-about 2
Radio-about 10

2.

Gas Record
Wednesday purchase
30 liters super
Thursday purchase
42 liters regular

Super gasoline
\$.14 per liter
Regular gasoline
\$.13 per liter

3.

Car
9.5 kilometers per liter
Motorcycle
14.5 kilometers per liter

Gasoline Used
8 liters

4.

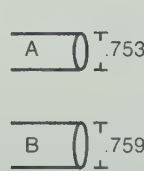
Daily Expenses
Mon: \$5.75
Tues: \$3.82
Wed: \$4.97
Thurs: \$6.39
Fri: \$7.45


5.

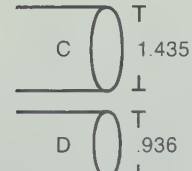
Cereal A	
Vitamin B ₁	.17 mg
Niacin	1.1 mg
Iron	22.5 mg
Phosphorus	87.6 mg
Riboflavin	.8 mg


Cereal B	
Vitamin B ₁	.23 mg
Niacin	4.25 mg
Iron	3.46 mg
Phosphorus	123.67 mg
Riboflavin	.15 mg


6.


A  .753

B  .759

C  1.435

D  .936

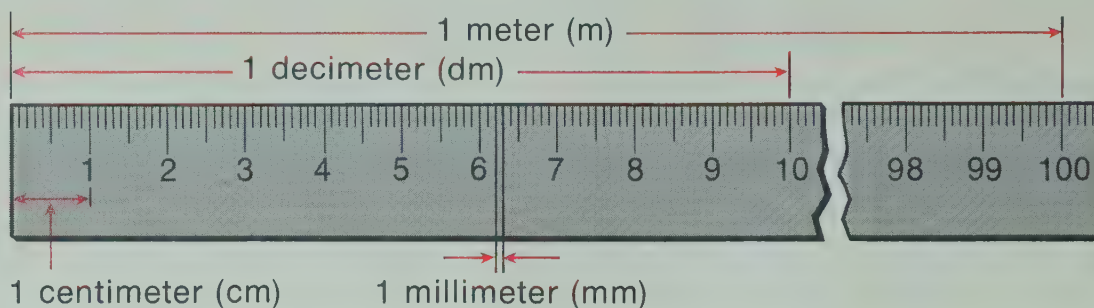
E  .876

F  .793

Diameter of steel rods

Decimals and Metric Measurement

- Complete this chart to help you understand the relationships between some of the units of length in the metric system. (Use decimals.)

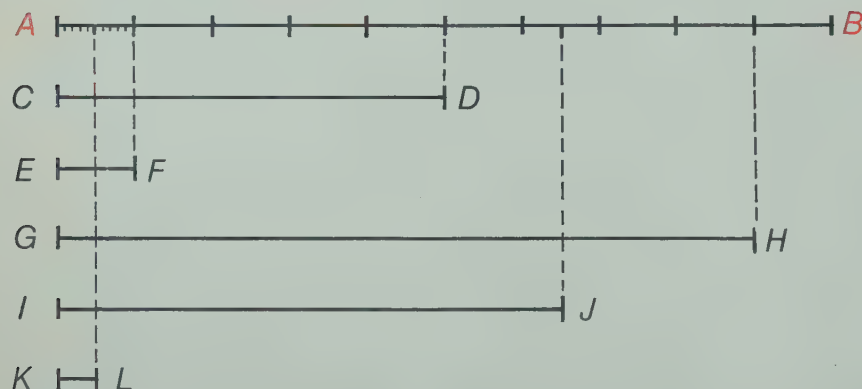


There are 10 decimeters in a meter. A decimeter is _____ of a meter.

There are 10 centimeters in a decimeter. A centimeter is _____ of a decimeter.


There are 100 centimeters in a meter. A centimeter is _____ of a meter.

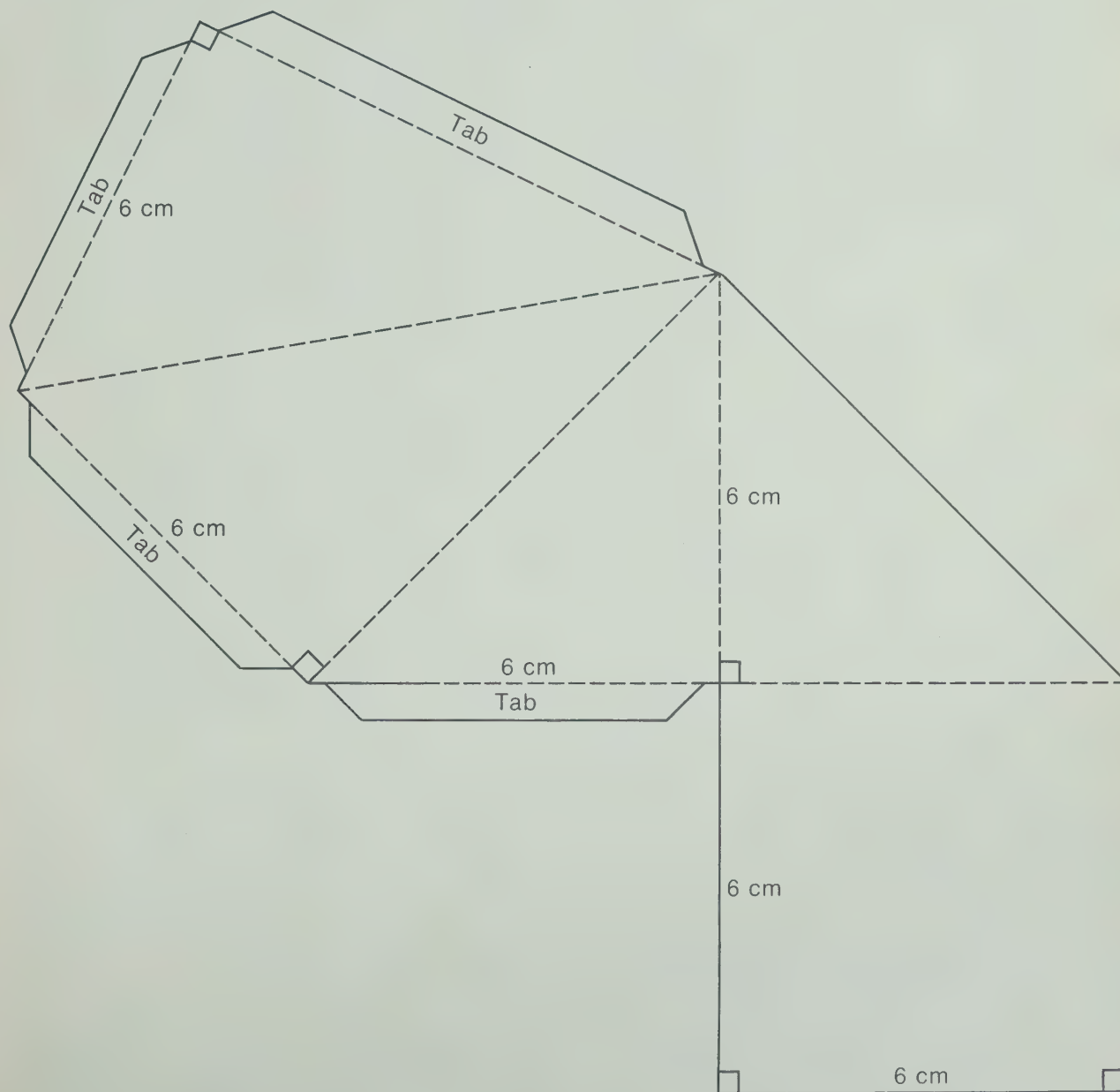
Segment \overline{AB} has length 1 decimeter. .10 of segment \overline{AB} has length 1 centimeter.
 .01 of segment \overline{AB} has length 1 millimeter.



- Write decimals or whole numbers to complete this chart.

Segment	Length in millimeters	Length in centimeters	Length in decimeters	Length in meters
\overline{AB}		10	1	
\overline{CD}	50			.05
\overline{EF}				
\overline{GH}				
\overline{IJ}				
\overline{KL}				

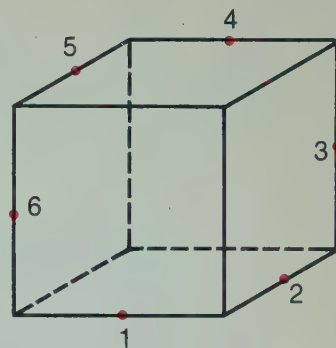
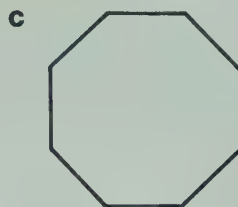
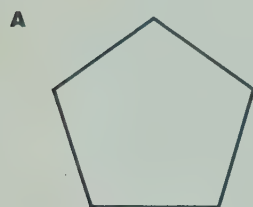
Draw 3 of these patterns on light poster board and cut them out. Fold on the dotted lines and tape the edges together to make pyramids.  Can you place the 3 pyramids together to form a cube?



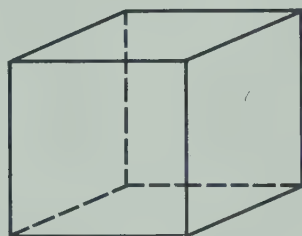
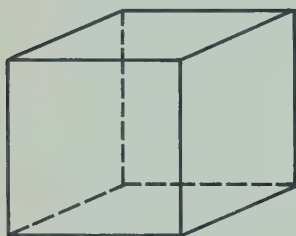
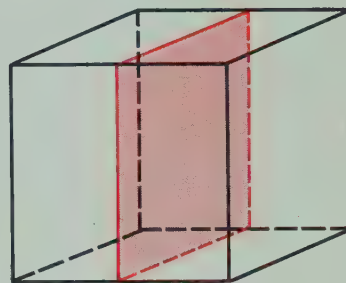
● Cube Capers

Can you answer these questions about a cube?

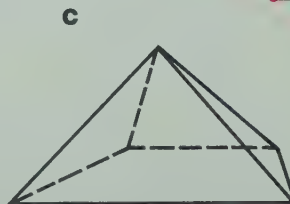
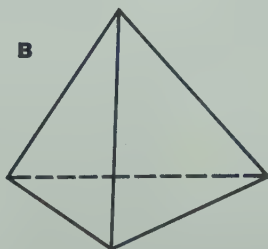
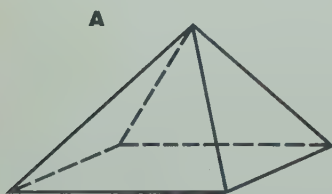
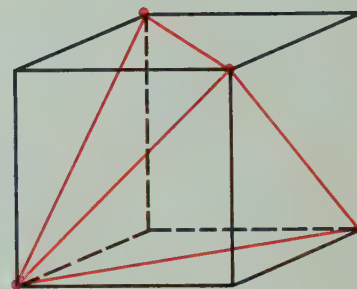
1. If you connect the points the resulting figure would look like



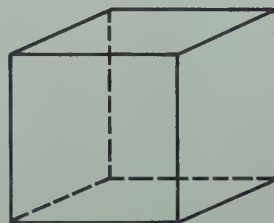
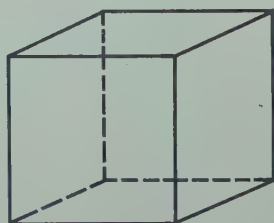
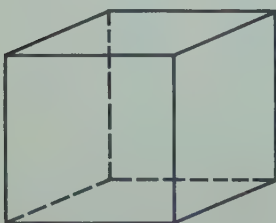
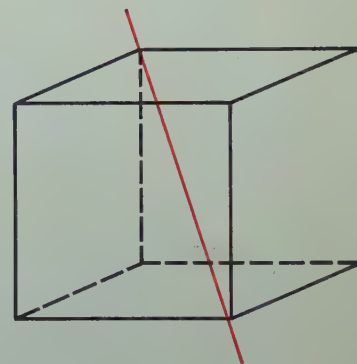
2. The red plane is parallel to two faces of the cube and divides the cube into two identical parts. Draw two more planes, different from this one, that do the same thing.



3. A space figure has been made by connecting 4 vertices of the cube with red lines. This figure, if removed and placed on a table, would look like



4. The red line goes through opposite vertices of the cube. Show 3 red lines, in different positions from this one, that also do this.

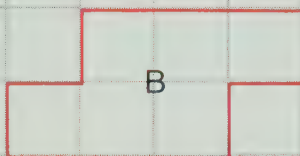
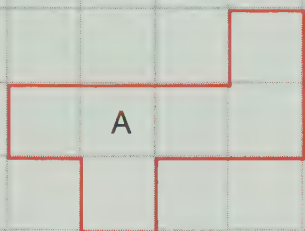


● Finding Patterns for Cubes

Pattern A can be folded to form a cube. Pattern B cannot. There are 11 patterns which, like A, can be folded to make a cube.

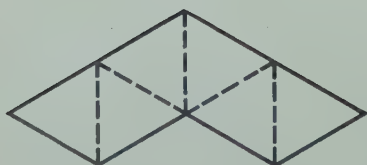
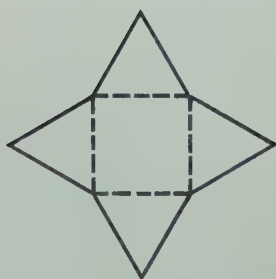
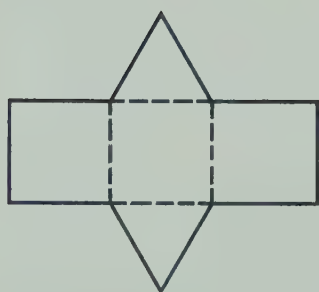
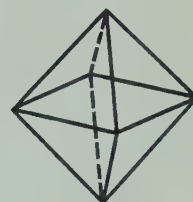
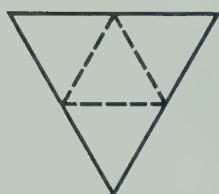
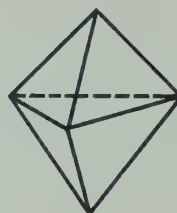
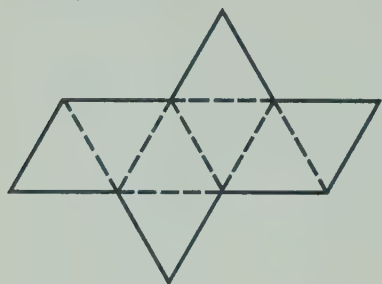


How many of them can you draw? (You may want to cut your patterns out and try them.)



● Pattern Problems

Each pattern in the first column can be folded to make one of the space figures in the second column. Draw lines to match each pattern with its completed space figure.



Use one of the patterns above and make one of the space figures.

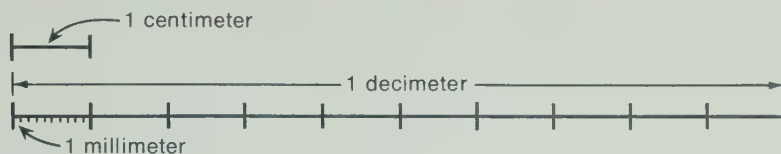
● Volume in the Metric System

Remember:

10 decimeters = 1 meter

10 centimeters = 1 decimeter

10 millimeters = 1 centimeter



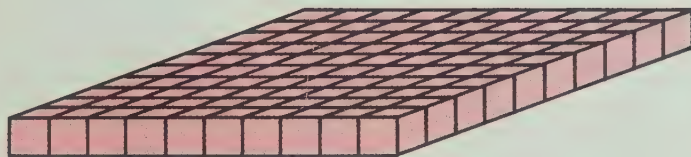
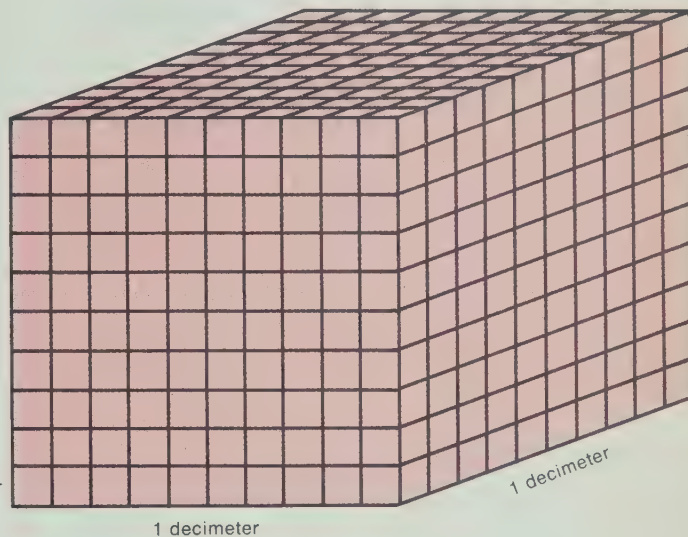
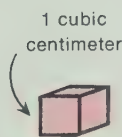
Can you answer these questions about volume in the metric system?

1. Suppose that this is a picture of a cubic decimeter and a cubic centimeter.

A How many cubic centimeters are in one "row" of the cubic decimeter?



B How many "rows" are in one "layer" of the cubic decimeter? _____



C How many layers are in the cubic decimeter? _____

D How many cubic centimeters are needed to form a cubic decimeter? _____

The volume of 1 cubic decimeter = _____ cubic centimeters.

2. A How many cubic decimeters are needed to make a "row" 1 meter long? _____

B How many such rows are needed to make a layer that is 1 meter on each side? _____

C How many such layers are needed to make a cubic meter? _____

D How many cubic decimeters are needed to make a cubic meter? _____

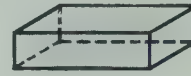
The volume of a cubic meter = _____ cubic decimeters.

3. How many cubic millimeters are needed to make a cubic centimeter? _____

a cubic decimeter? _____ a cubic meter? _____

● Finding Volume and Surface Area

Use your ruler and measure “objects” in your classroom or at home that are shaped like rectangular prisms. Choose an appropriate unit (millimeter, centimeter, decimeter, or meter) and measure the length, width, and height of each object. Then find the volume and surface area of the “object.”



1. A chalkboard eraser



Length _____

Width _____

Height _____
your chosen unit

Volume = _____
unit

Surface area = _____
unit

2. A crayon or pencil box

Length _____

Width _____

Height _____
your chosen unit

Volume = _____
unit

Surface area = _____
unit

3. Your Mathematics book



Length _____

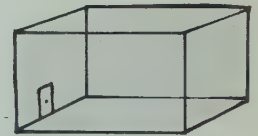
Width _____

Height _____
your chosen unit

Volume _____
unit

Surface area _____
unit

4. Your classroom



Length _____

Width _____

Height _____
your chosen unit

Volume _____
unit

Surface area _____
unit

5. A shoe box, gift box, or other box.



Length _____

Width _____

Height _____
your chosen unit

Volume _____
unit

Surface area _____
unit

6. An “object” of your choice

Length _____

Width _____

Height _____
your chosen unit

Volume _____
unit

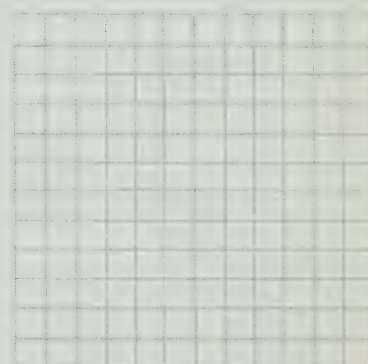
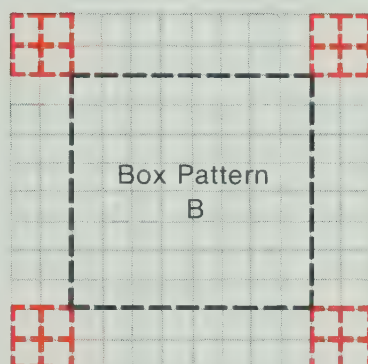
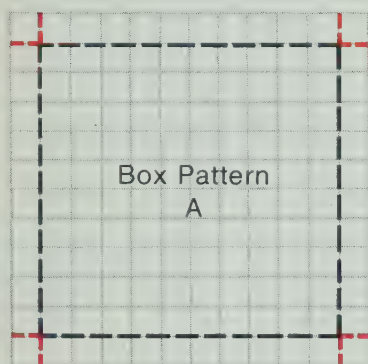
Surface area _____
unit

● Exploring Volume and Surface Area

1. When does the volume of a cube equal the surface area of the cube?

Complete as many lines of this table as necessary to answer the question.

Length of side of cube	Volume	Surface area
1		
2		
3		
4		
5		
6		
7		
8		

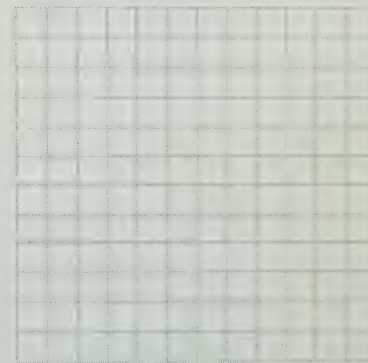
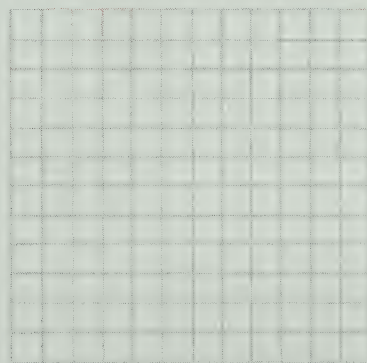
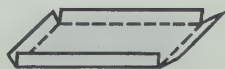


2. Start with a 12 by 12 piece of graph paper. Make patterns for boxes by first cutting 1 square from each corner, then 4, then 9, then 16, then 25. Guess which box has the

largest volume? _____

Surface area? _____

(without the top)

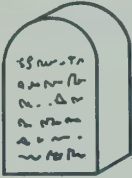





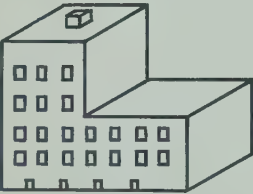





Complete this table to check your guesses.

Box	A	B	C	D	E
Volume					
Surface Area (don't count the top of the box)					

●What's Your Point of View?


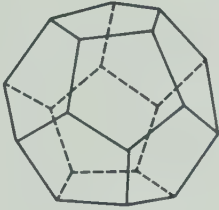
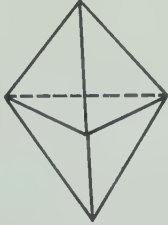
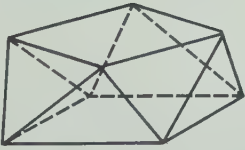
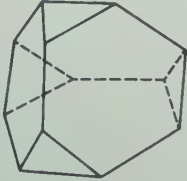
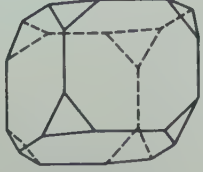
Can you draw the top view, front view, and side view for each object?

Object	Top View	Front View	Side View
 <p>Historical marker stone</p>			
 <p>Equipment shed</p>			
 <p>Refrigerator-freezer</p>			
 <p>Office building</p>			
 <p>"A-Frame" house</p>			
 <p>Movie camera</p>			
 <p>Office desk</p>			

●Checking a Formula

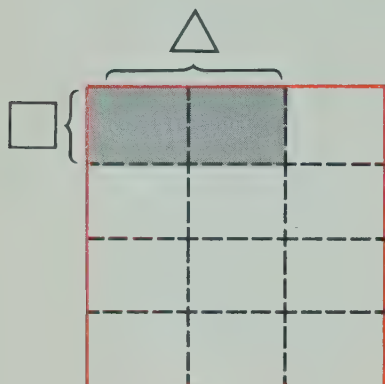
After exploring some simple solid figures, one class decided that “the number of vertices (V) + the number of faces (F) – 2 equals the number of edges (E).”

Check this formula for each solid figure below. Does it work? _____

Solid figure	Number of vertices V	Number of faces F	$V + F - 2$	Number of Edges E
Tetrahedron equilateral triangle faces 				
Dodecahedron each face is a pentagon 				
Deltahedron all faces are equilateral triangles 				
Square Antiprism faces are squares and equilateral triangles 				
Truncated Tetrahedron formed by cutting off the corners of a tetrahedron 				
Truncated Cube formed by cutting off the corners of a cube 				

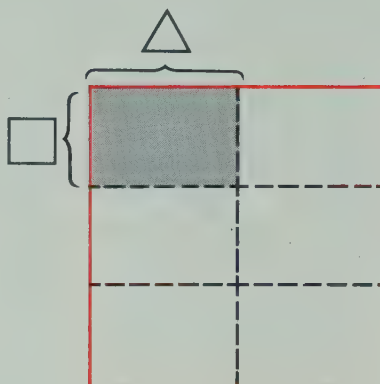
The red square is the unit of area. The length of each side of the red square is 1. Write the length (using a fraction) for the indicated segment in each

\square and \triangle . Then complete the multiplication equation.



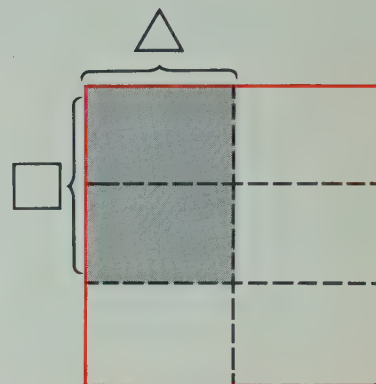
$$\frac{1}{4} \times \frac{2}{3} = \underline{\hspace{2cm}}$$

width length what part of the unit square is shaded?
This product is the area of the shaded part.



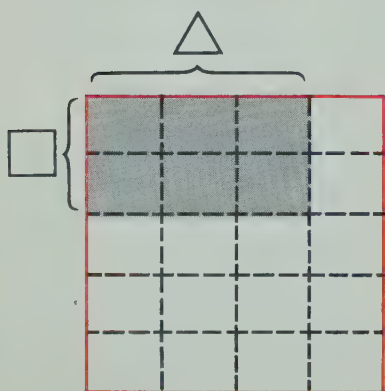
$$\square \times \triangle = \underline{\hspace{2cm}}$$

area of shaded part fraction of unit square used.

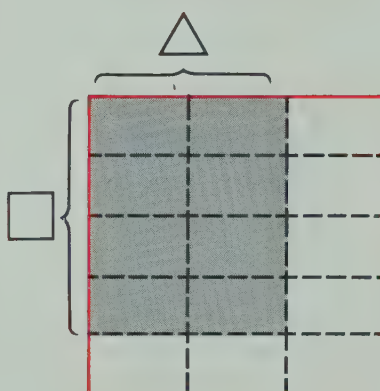


$$\square \times \triangle = \underline{\hspace{2cm}}$$

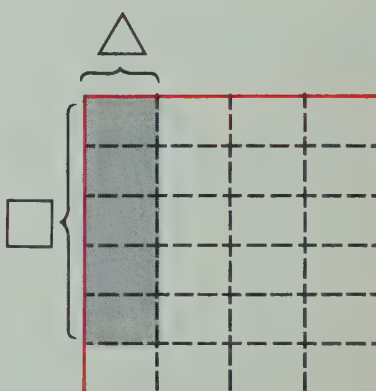
area of shaded part fraction of unit square used.



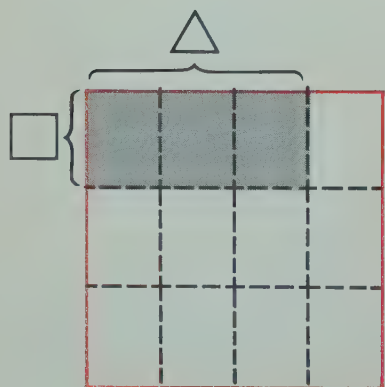
$$\square \times \triangle = \underline{\hspace{2cm}}$$



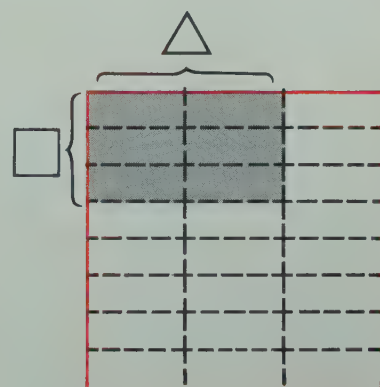
$$\square \times \triangle = \underline{\hspace{2cm}}$$



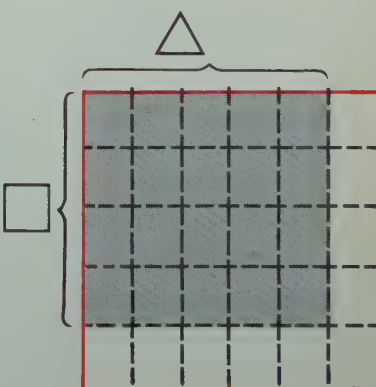
$$\square \times \triangle = \underline{\hspace{2cm}}$$



$$\square \times \triangle = \underline{\hspace{2cm}}$$




$$\square \times \triangle = \underline{\hspace{2cm}}$$




$$\square \times \triangle = \underline{\hspace{2cm}}$$

● Function Machines and Fraction Multiplication

When a wire is put into the function machine it can be made longer or shorter.
Give the length of the first output wire in the . Then complete the equation by giving the length of the final output wire.

input wire 25 mm

THE FUNCTION MACHINE	
FUNCTION RULE	
Make 2 times as long.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>




THE FUNCTION MACHINE	
FUNCTION RULE	
Make $\frac{1}{5}$ as long.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Write the length of the output wire here. $25 \times \frac{2}{5} = \underline{\hspace{2cm}}$

input wire 25 mm

THE FUNCTION MACHINE	
FUNCTION RULE	
Make $\frac{1}{5}$ times as long.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>




THE FUNCTION MACHINE	
FUNCTION RULE	
Make 2 as long.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Write the length of the output wire here. $25 \times \frac{2}{5} = \underline{\hspace{2cm}}$

input wire 18 mm

THE FUNCTION MACHINE	
FUNCTION RULE	
Make $\frac{1}{3}$ times as long.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>




THE FUNCTION MACHINE	
FUNCTION RULE	
Make 2 as long.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Write the length of the output wire here. $18 \times \frac{2}{3} = \underline{\hspace{2cm}}$

input wire 36 mm

THE FUNCTION MACHINE	
FUNCTION RULE	
Make 2 times as long.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>




THE FUNCTION MACHINE	
FUNCTION RULE	
Make $\frac{1}{8}$ as long.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Write the length of the output wire here. $36 \times \frac{2}{8} = \underline{\hspace{2cm}}$

input wire 30 mm

THE FUNCTION MACHINE	
FUNCTION RULE	
Make $\frac{1}{6}$ times as long.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>



THE FUNCTION MACHINE	
FUNCTION RULE	
Make 5 as long.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Write the length of the output wire here. $30 \times \frac{5}{6} = \underline{\hspace{2cm}}$

● Searching for Missing Factors

Find the missing factor in column 1, if possible. If not, find it in column 2.
If you can't find it in column 1 or 2, use column 3.

Column 1

Column 2

Column 3

- | | | | | |
|---|-----------------------|--|-----------------------|--|
| 1. $\overset{P}{\frac{12}{25}} \div \overset{F}{\frac{3}{5}} =$ | \longleftrightarrow | $\overset{P}{\frac{12 \times 3}{25 \times 3}} \div \overset{F}{\frac{3}{5}} =$ | \longleftrightarrow | $\overset{P}{\frac{12 \times 3 \times 5}{25 \times 3 \times 5}} \div \overset{F}{\frac{3}{5}} =$ |
| 2. $\overset{P}{\frac{8}{21}} \div \overset{F}{\frac{2}{3}} =$ | \longleftrightarrow | $\overset{P}{\frac{8 \times 2}{21 \times 2}} \div \overset{F}{\frac{2}{3}} =$ | \longleftrightarrow | $\overset{P}{\frac{8 \times 2 \times 3}{21 \times 2 \times 3}} \div \overset{F}{\frac{2}{3}} =$ |
| 3. $\frac{15}{24} \div \frac{5}{8} =$ | \longleftrightarrow | $\frac{15 \times 5}{24 \times 5} \div \frac{2}{3} =$ | \longleftrightarrow | $\frac{15 \times 5 \times 3}{24 \times 5 \times 3} \div \frac{2}{3} =$ |
| 4. $\frac{2}{5} \div \frac{2}{3} =$ | \longleftrightarrow | $\frac{2 \times 3}{5 \times 3} \div \frac{2}{3} =$ | \longleftrightarrow | $\frac{2 \times 3 \times 2}{5 \times 3 \times 2} \div \frac{2}{3} =$ |
| 5. $\frac{4}{7} \div \frac{2}{5} =$ | \longleftrightarrow | $\frac{4 \times 5}{7 \times 5} \div \frac{2}{5} =$ | \longleftrightarrow | $\frac{4 \times 5 \times 2}{7 \times 5 \times 2} \div \frac{2}{5} =$ |
| 6. $\frac{3}{8} \div \frac{5}{4} =$ | \longleftrightarrow | $\frac{3 \times 5}{8 \times 5} \div \frac{5}{4} =$ | \longleftrightarrow | $\frac{3 \times 5 \times 4}{8 \times 5 \times 4} \div \frac{5}{4} =$ |
| 7. $\frac{4}{7} \div \frac{3}{5} =$ | \longleftrightarrow | $\frac{4 \times 3}{7 \times 3} \div \frac{3}{5} =$ | \longleftrightarrow | $\frac{4 \times 3 \times 5}{7 \times 3 \times 5} \div \frac{3}{5} =$ |
| 8. $\frac{2}{3} \div \frac{3}{4} =$ | \longleftrightarrow | $\frac{2 \times 3}{3 \times 3} \div \frac{3}{4} =$ | \longleftrightarrow | $\frac{2 \times 3 \times 4}{3 \times 3 \times 4} \div \frac{3}{4} =$ |
| 9. $\frac{3}{8} \div \frac{4}{5} =$ | \longleftrightarrow | $\frac{3 \times 4}{8 \times 4} \div \frac{4}{5} =$ | \longleftrightarrow | $\frac{3 \times 4 \times 5}{8 \times 4 \times 5} \div \frac{4}{5} =$ |
| 10. $\frac{3}{4} \div \frac{7}{2} =$ | \longleftrightarrow | $\frac{3 \times}{4 \times} \div \frac{7}{2} =$ | \longleftrightarrow | $\frac{3 \times \times}{4 \times \times} \div \frac{7}{2} =$ |
| | | Complete the equation to find the missing factor. | | |
| 11. $\frac{7}{10} \div \frac{2}{3} =$ | \longleftrightarrow | $\frac{7 \times}{10 \times} \div \frac{2}{3} =$ | \longleftrightarrow | $\frac{7 \times \times}{10 \times \times} \div \frac{2}{3} =$ |
| | | Complete the equation to find the missing factor. | | |

● Figuring the Cost of Electrical Energy

In a recent year, the information in this table was given as the cost of operating these appliances in the "average home." This cost did not include the state and local taxes that must be added to each homeowner's electric bill.

Use the following information and figure the total cost for operating these appliances for a month (30 days).

Appliance

Cost

Electric clock	$\frac{1}{3}$ ¢ per day
Clothes dryer	13¢ per load
Dishwasher	3¢ per day
Refrigerator-Freezer	$7\frac{1}{2}$ ¢ per day
Iron	$2\frac{1}{3}$ ¢ per hour
Radio	$\frac{1}{5}$ ¢ per hour
Television	$1\frac{1}{2}$ ¢ per hour
Toaster	$1\frac{1}{2}$ ¢ for 30 slices
100-Watt light bulb	$\frac{1}{2}$ ¢ per hour
Clothes washer	$1\frac{1}{2}$ ¢ per hour

Monthly Cost

Clock—runs all the time.

Clothes dryer—2 loads each day.

Dishwasher—used daily.

Refrigerator-Freezer—used daily.

Iron—used an average of 2 hours per day.

Radio—used 7 hours per day.

Television—used 10 hours per day.

Toaster—8 slices per day.

Light bulb—on 6 hours each day.

Clothes washer—used an average of 2 hours per day.

Work Space

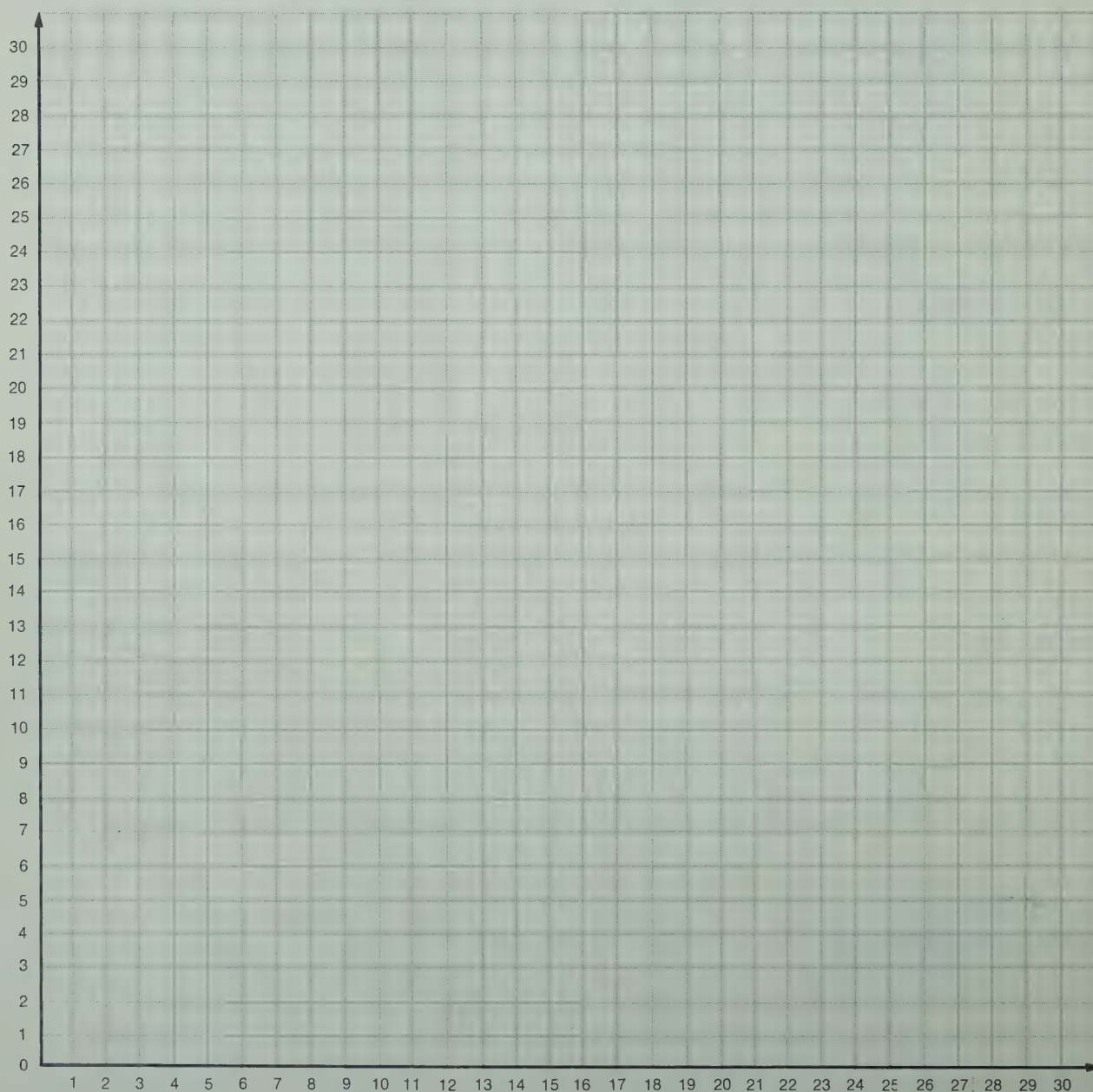
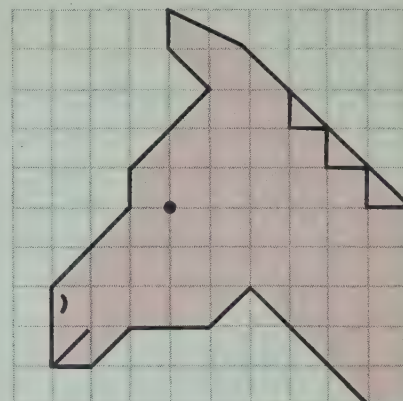
Total cost of appliances

\$ _____

Follow the instructions to invent a graph picture.

1. Think of something you would like to draw.
2. Practice drawing it, using lines between points, on a spare sheet of graph paper.
3. Draw the final picture on the graph paper below.
4. List the points, in order, so someone could draw your picture by connecting the points.

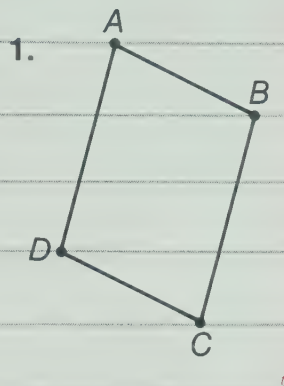
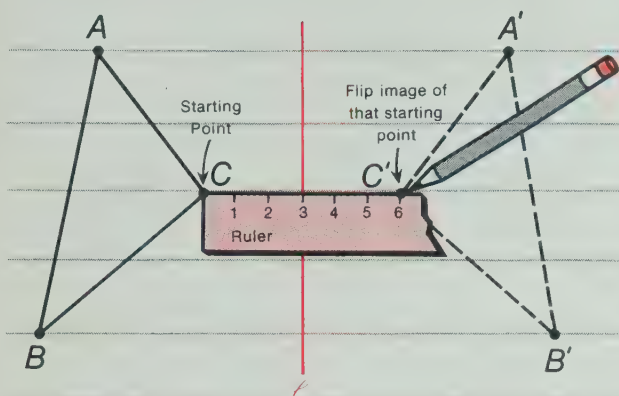
Ordered points: _____



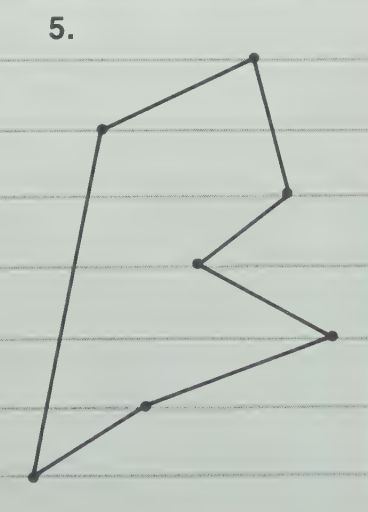
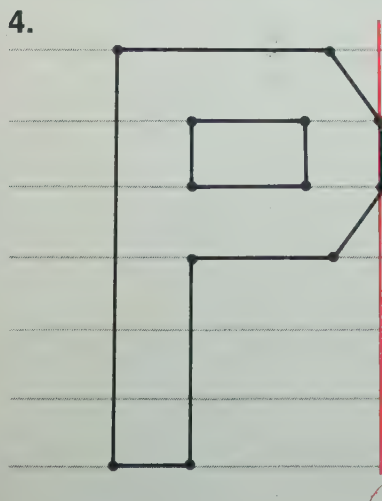
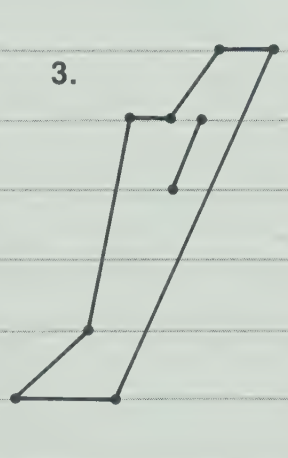
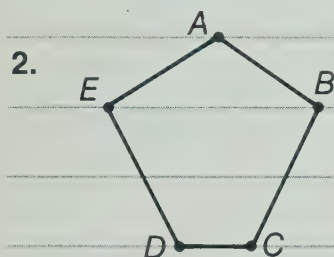
● Flips Without Flops

The red line in each picture is the “flip line” (line of symmetry). Study the example to find the “flip image” of any point across this line. Then use your centimeter ruler and find the “flip image” of each figure.

EXAMPLE

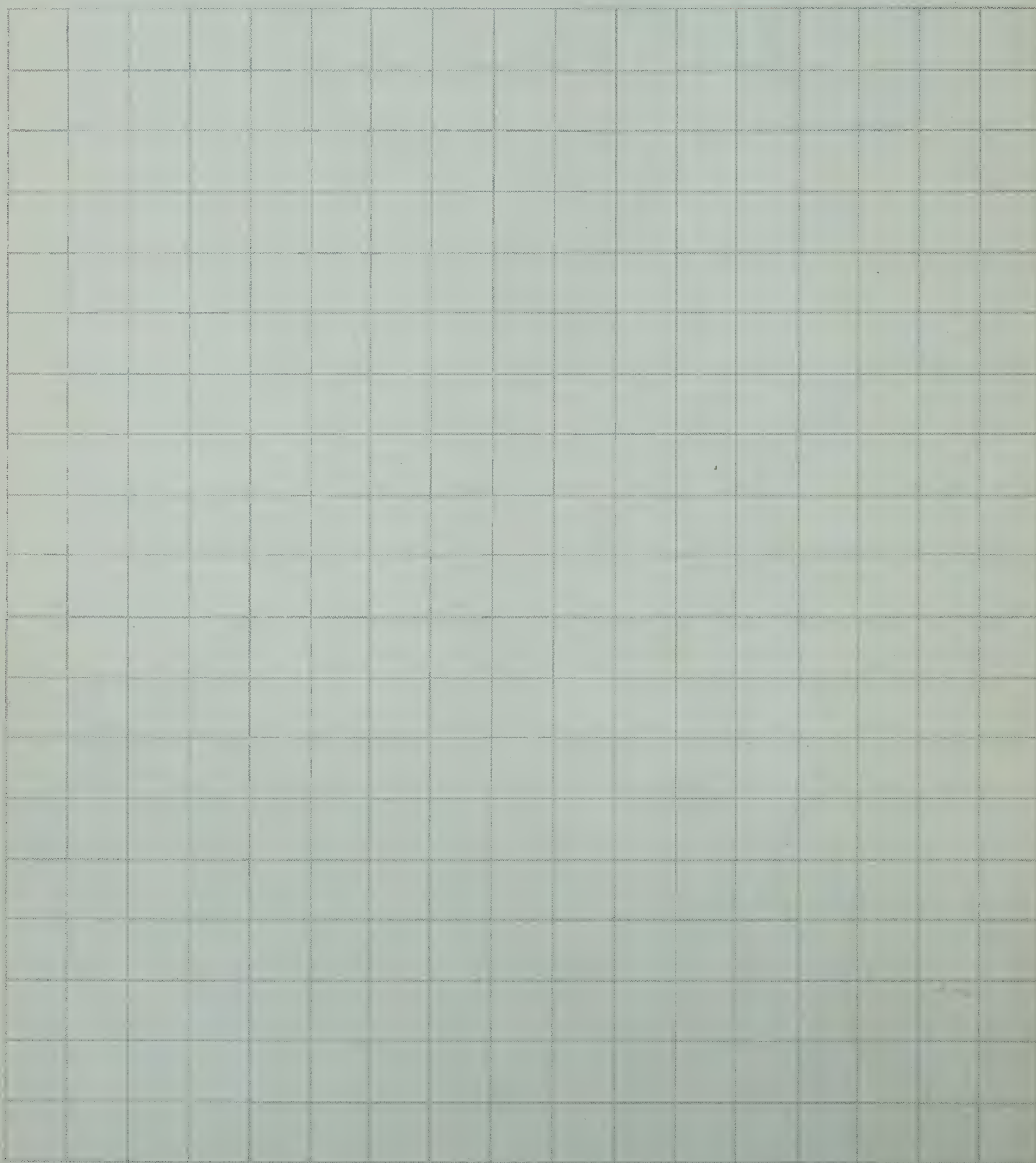
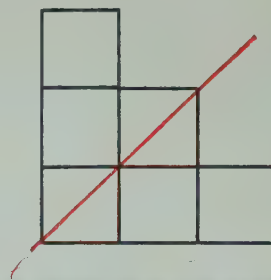


How to find the “flip image” of a figure.



● Finding Lines of Symmetry

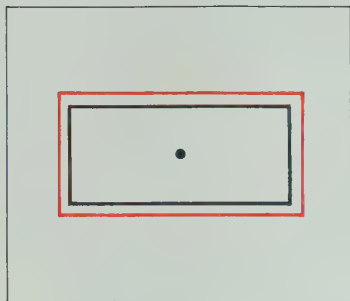
A *Hexominoe* is a pattern made by putting six squares together. (Each square must have at least one side in common with another square). This hexominoe has a line of symmetry. How many differently shaped hexominoes can you draw below which have a line(s) of symmetry? Show each line of symmetry.



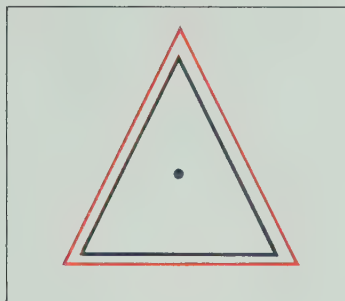
● Rotating Geometric Figures

The pictures below show cardboard geometric figures fastened to a sheet of paper. A red outline is drawn around each figure. Check (✓) the figures that will fit back inside the outline when turned only part of the way around.

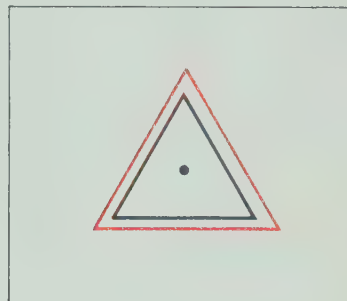
1.



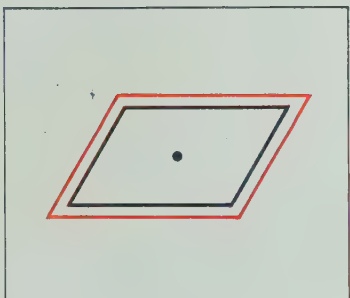
2.



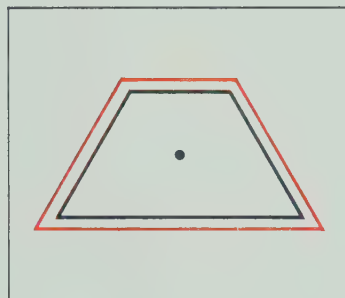
3.



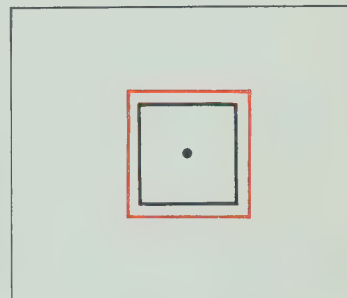
4.



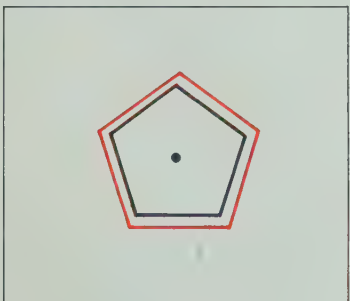
5.



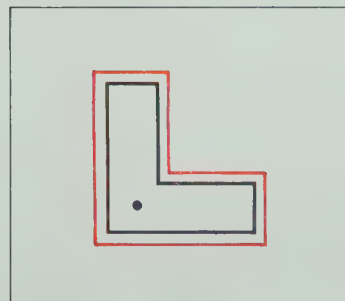
6.



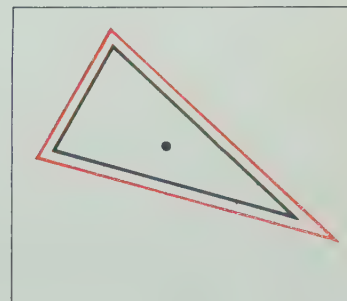
7.



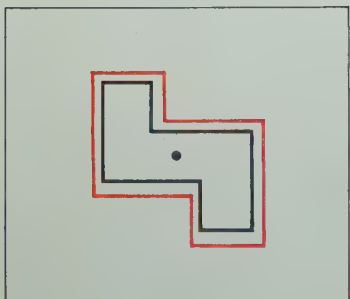
8.



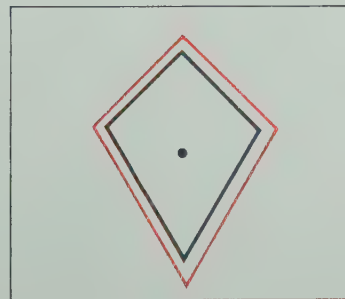
9.



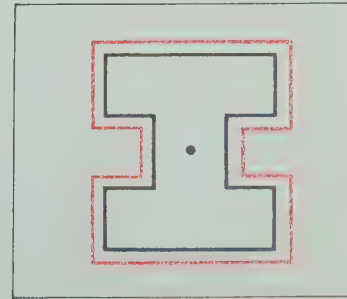
10.



11.



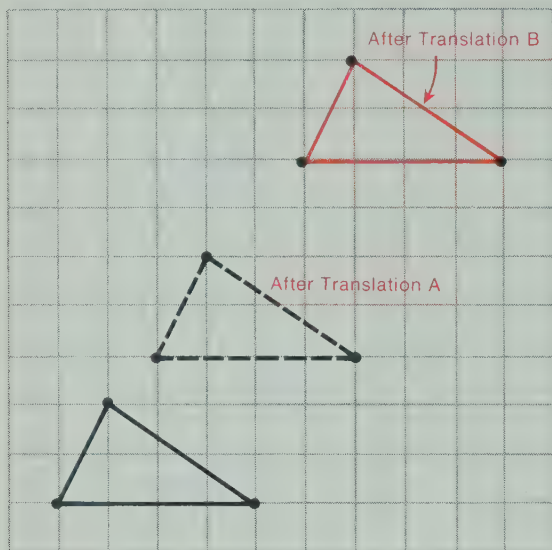
12.



Combining Translations

Two translations (slides) are given for each part. Slide each point, using Translation A. Then slide the points using Translation B. What single slide (Translation C) would have moved the figure to the same position?

EXAMPLE:

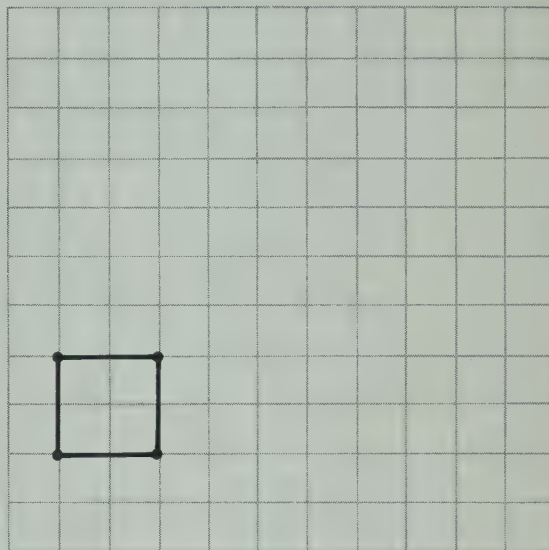


Translation A: right 2, up 3

Translation B: right 3, up 4

Translation C: right 5, up 7

1.

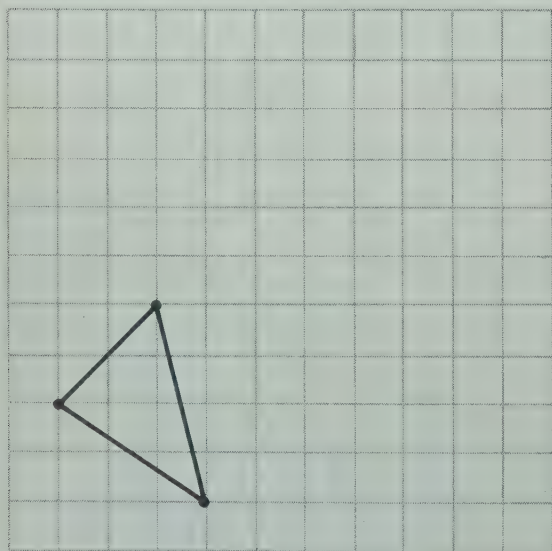


Translation A: right 1, up 4

Translation B: right 5, up 2

Translation C: right _____, up _____

2.

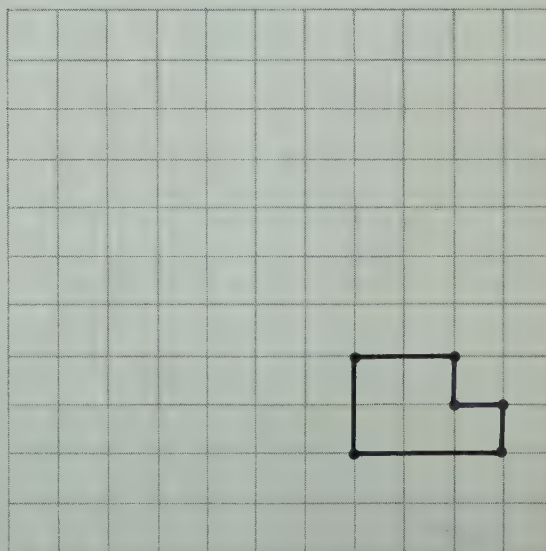


Translation A: right 2, down 1

Translation B: right 4, up 6

Translation C: right _____, up _____

3.



Translation A: left 7, up 6

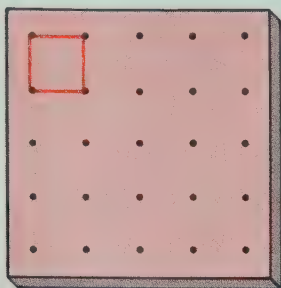
Translation B: right 7, down 4

Translation C: _____

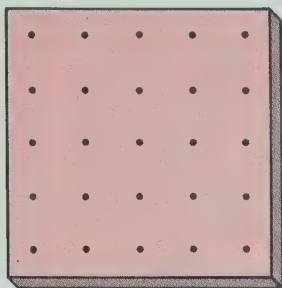
● Seeking Similar Figures

Similar figures are exactly the same shape, but do not need to be congruent. For each figure given on geoboard A, draw a figure that is similar to it on geoboard B. Choose your figure so that the two figures will not be congruent.

1.

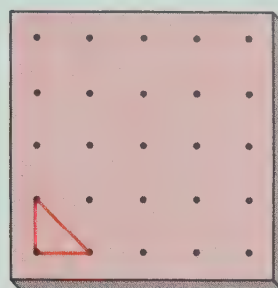


A

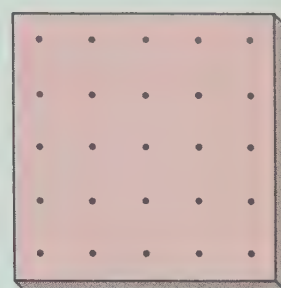


B

2.

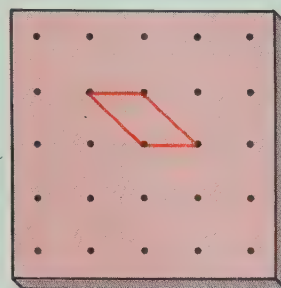


A

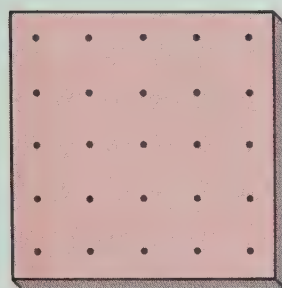


B

3.

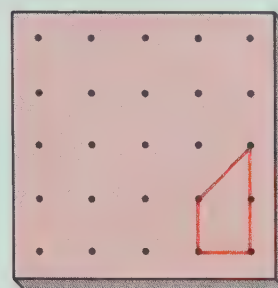


A

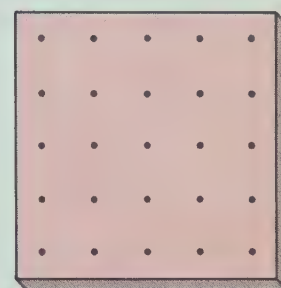


B

4.

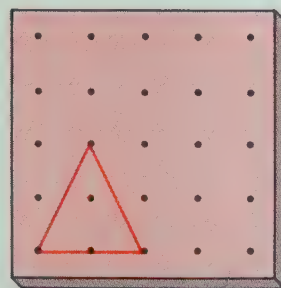


A

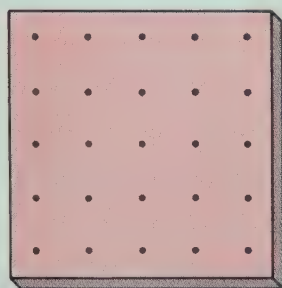


B

5.

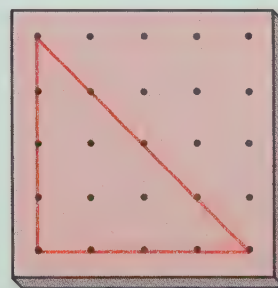


A

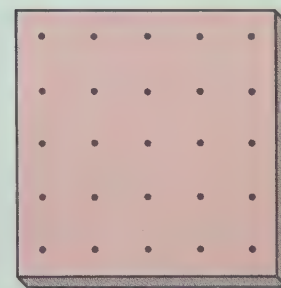


B

6.

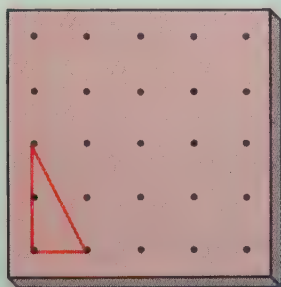


A

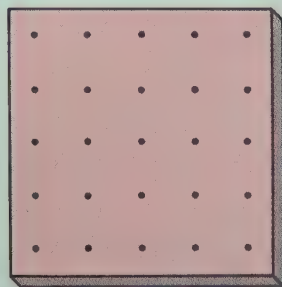


B

7.

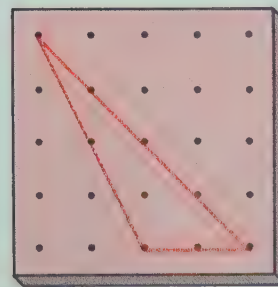


A

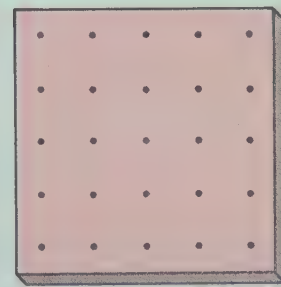


B

8.



A

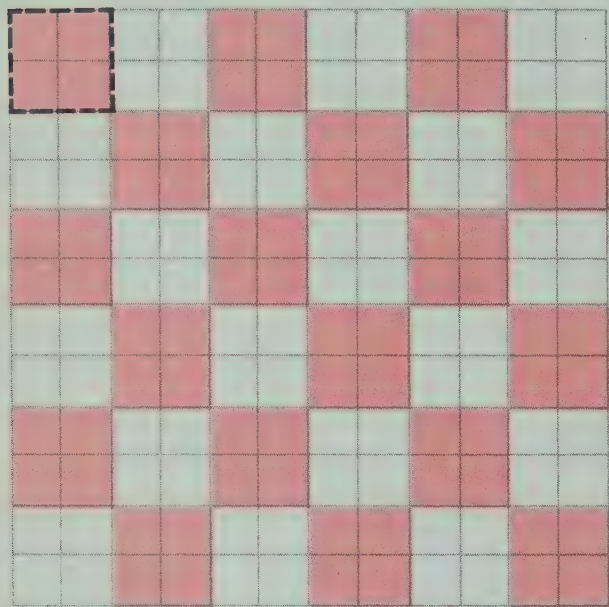


B

● Coloring Tessellations on Square Grids

Color each grid to show the tessellation indicated. Color every other basic figure.

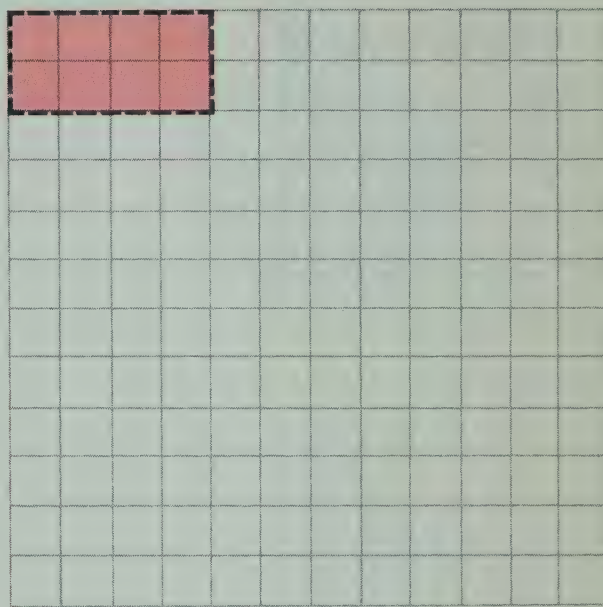
EXAMPLE:



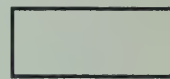
This grid is colored to show a tessellation of squares.



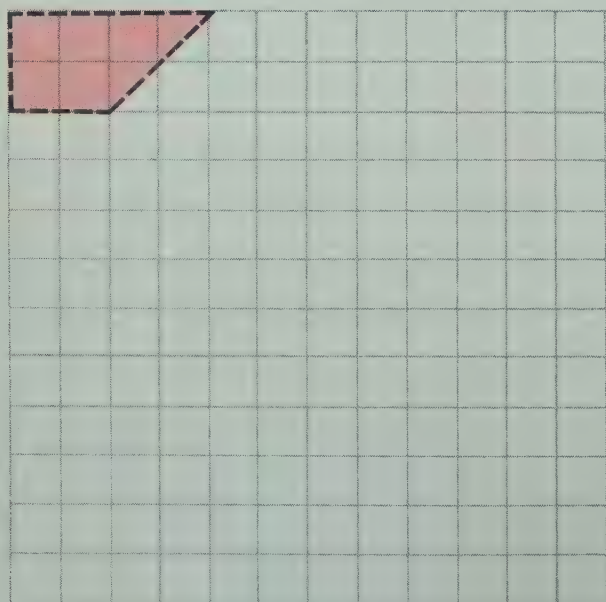
1.



Color this grid to show a tessellation of rectangles.



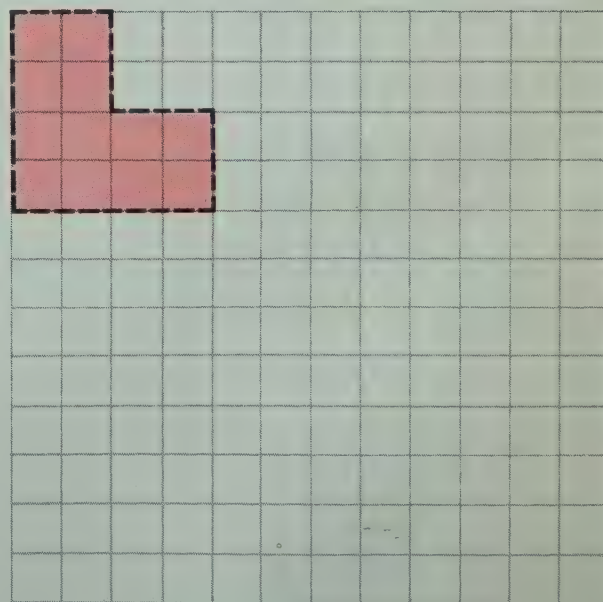
2.



Color this grid to show a tessellation of trapezoids.



3.

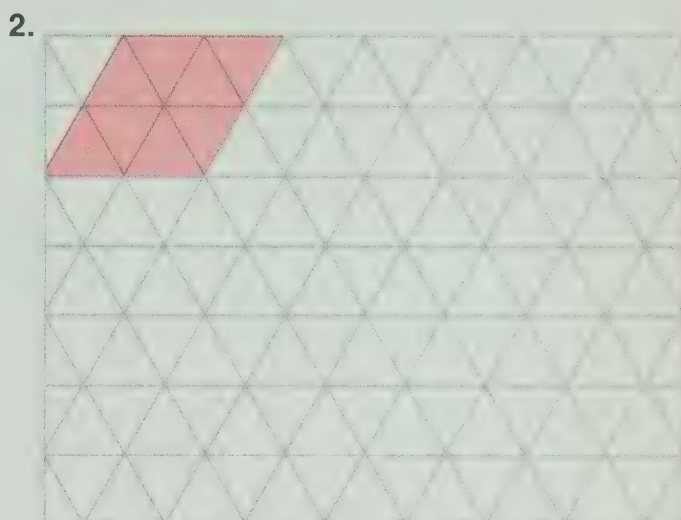
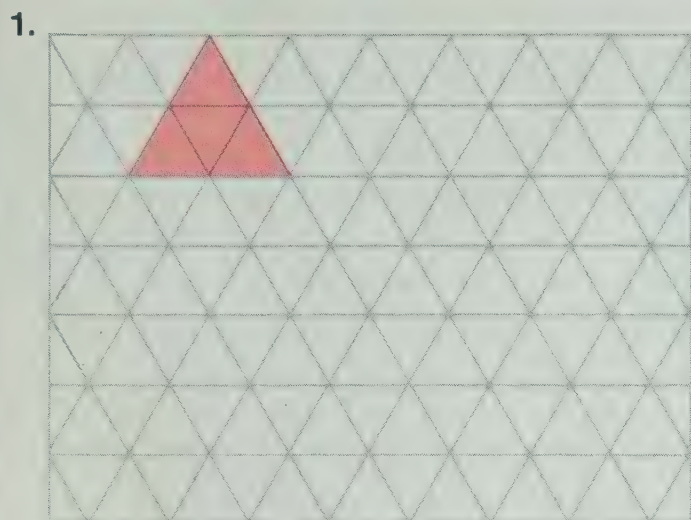


Color this grid to show a tessellation of "L" shaped hexagons.



● Tessellations on Triangular Grids

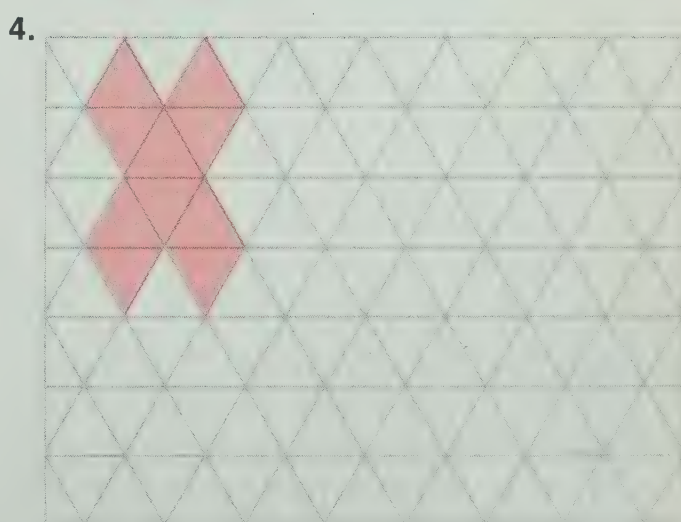
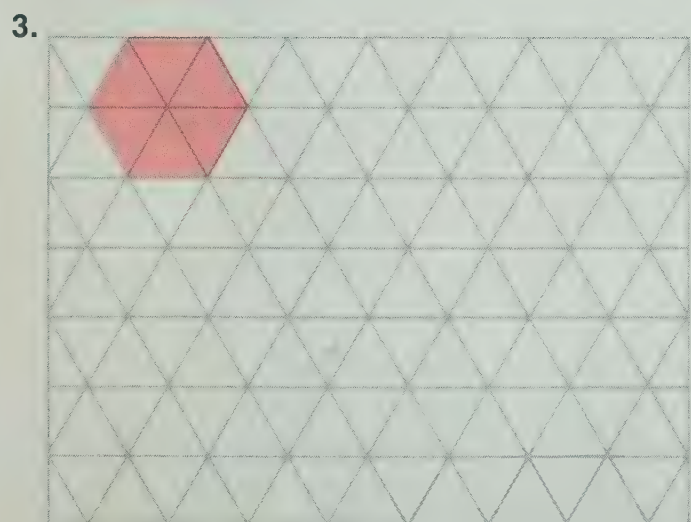
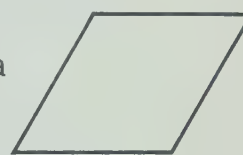
Color each grid to show the tessellation indicated. Color every other basic figure.



Color this grid to show a tessellation of triangles.



Color this grid to show a tessellation of rhombi.



Color this grid to show a tessellation of hexagons.



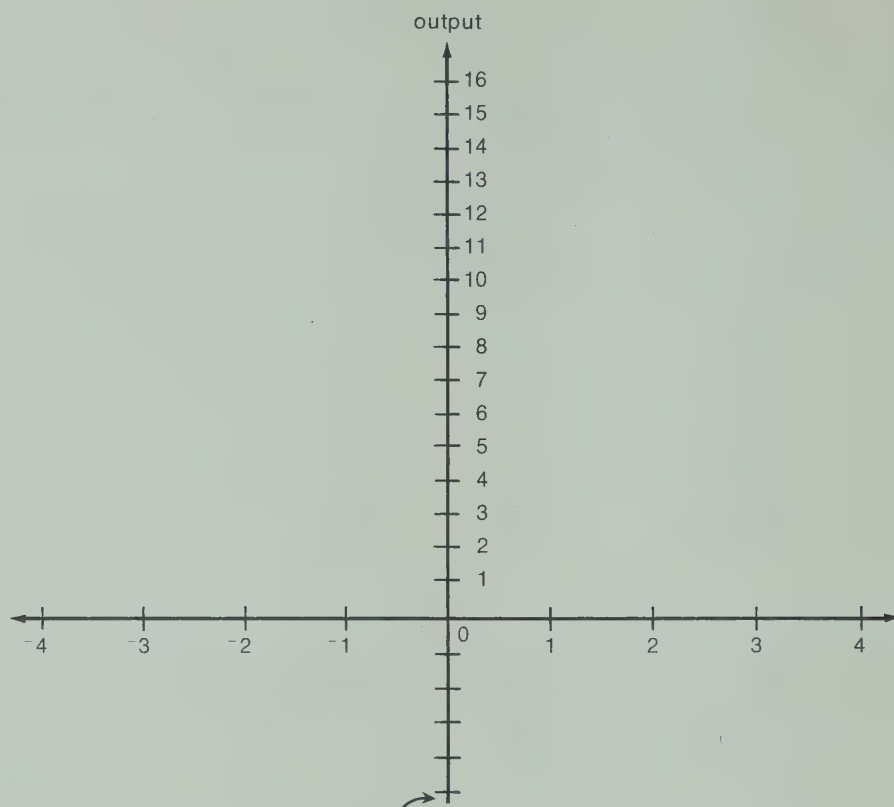
Color this grid to show a tessellation of "crosses."



● Patterns in Graphs

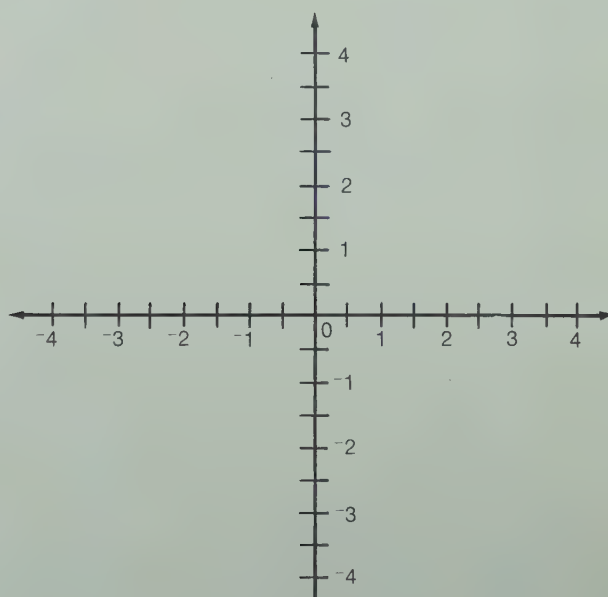
Find the pattern and complete each function table. Then graph the points and connect them with a smooth line.

input	output
4	16
3	9
2	4
1	1
0	0
-1	1
-2	4
-3	_____
-4	_____




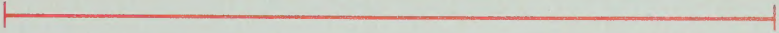
These points should produce the graph of a curve called a **parabola**.

input	output
4	$\frac{1}{4}$
-4	$-\frac{1}{4}$
3	$\frac{1}{3}$
-3	_____
2	_____
-2	$-\frac{1}{2}$
1	1
-1	-1
$\frac{1}{2}$	2
$-\frac{1}{2}$	_____
$\frac{1}{3}$	_____
$-\frac{1}{3}$	-3
$\frac{1}{4}$	_____



These points should produce the graph of a curve called a **hyperbola**.

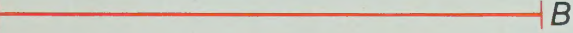
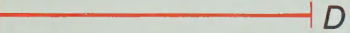
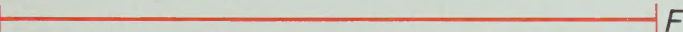

 1 **centimeter** (cm)


 1 **decimeter** (dm)

A decimeter is 10 centimeters long. A **meter** (m) is 10 decimeters long.

How many centimeters long is a meter? _____

Choose a unit and estimate the following lengths. Then measure to check your estimate. Did you estimate "too high" (H), "too low" (L), or "about right" (R)?

	Unit	Estimate	Actual Measure	Circle One
1. 	_____	_____	_____	H L R
2. 	_____	_____	_____	H L R
3. 	_____	_____	_____	H L R
4. Width of your desk	_____	_____	_____	H L R
5. Length of your book	_____	_____	_____	H L R
6. Your height	_____	_____	_____	H L R
7. The length of your classroom	_____	_____	_____	H L R
8. Width of your hand	_____	_____	_____	H L R
9. Height of the chalkboard	_____	_____	_____	H L R
10. Width of the window	_____	_____	_____	H L R
11. Width of your classroom	_____	_____	_____	H L R
12. Length of your shoe	_____	_____	_____	H L R

Key: Tablespoon-15 ml.; Cup-225 ml.; 1 gallon-3.84 liters or 3840 ml.;
 Juice can 177 ml.; Large pop bottle-480 ml.; Sink-(varies) 25 liters.

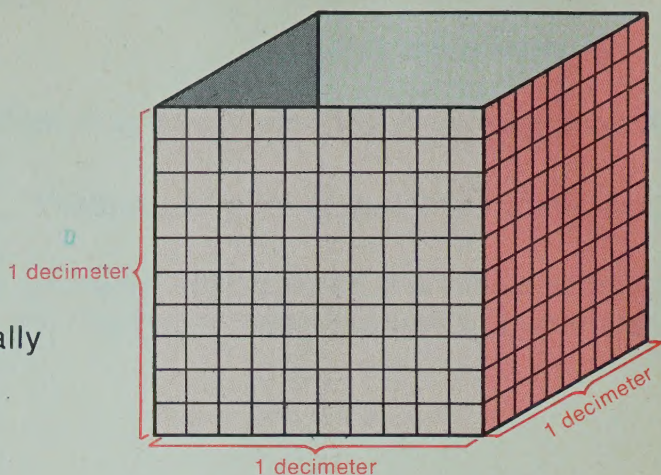
● Estimating Capacity in the Metric System





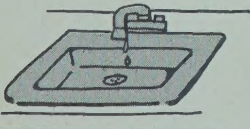

A cubic decimeter container will hold 1 liter (ℓ) of water.

There are _____ cubic centimeters in a cubic decimeter. A cubic centimeter container holds 1 **milliliter** (ml) of water.



Estimate the capacity in liters or milliliters of each of the following. Then find the correct capacity on the bottom of page 95. Do you usually estimate “too high” (H), “too low” (L), or “just right” (R).



Container	Unit	Estimate	Actual Capacity	Circle One
1.  Tablespoon	<u>ml</u>	_____	_____	H L R
2.  Cup	<u>ml</u>	_____	_____	H L R
3.  1 Gallon container	<u>ℓ</u>	_____	_____	H L R
4.  Large size pop bottle	<u>ml</u>	_____	_____	H L R
5.  Kitchen sink	<u>ℓ</u>	_____	_____	H L R
6.  Small frozen juice can	<u>ml</u>	_____	_____	H L R



* 000028386753 *

Use with
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16-17**Chapter 2 NUMBERS AND NUMERALS**

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| 8 | Large Numbers | 26-31 |
| 9 | Counting in Base Four | 32-33 |
| 10 | Other Bases for Numerals | 34-35 |
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Chapter 3 EQUATIONS AND OPERATIONS

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Chapter 4 GEOMETRY AND MEASUREMENT I

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